SDMS US EPA Region V

Imagery Insert Form

Document ID: 164974

Some images in this document may be illegible or unavailable in SDMS. Please see reason(s) indicated below:

☐ Illegible due to bad source documents. Image(s) in SDMS is equivalent to hard copy.

Specify Type of Document(s) / Comments:

☐ Includes _____ COLOR or _____ RESOLUTION variations.
Unless otherwise noted, these pages are available in monochrome. The source document page(s) is more legible than the images. The original document is available for viewing at the Superfund Records Center.

Specify Type of Document(s) / Comments:

☐ Confidential Business Information (CBI).
This document contains highly sensitive information. Due to confidentiality, materials with such information are not available in SDMS. You may contact the EPA Superfund Records Manager if you wish to view this document.

Specify Type of Document(s) / Comments:

☒ Unscannable Material:
Oversized __X__ or _____ Format.
Due to certain scanning equipment capability limitations, the document page(s) is not available in SDMS. The original document is available for viewing at the Superfund Records center.

Specify Type of Document(s) / Comments:

3 MAPS - EXISTING SITE FEATURES, SURFACE DRAINAGE AND SITE TOPOGRAPHY, WATER TABLE 1/11 & 12/01

☐ Document is available at the EPA Region 5 Records Center.

Specify Type of Document(s) / Comments:

Rev. 07/10/02

164974 F8
11/01

FEASIBILITY STUDY

BELOIT CORPORATION ROCKTON FACILITY NPL SITE
ROCKTON, ILLINOIS

November 2001

Prepared For:
Beloit Liquidating Trust
• • •
Prepared By:
Montgomery Watson Harza
Madison, Wisconsin

Project No. 2082402.01180101

MWH
MONTGOMERY WATSON HARZA

FEASIBILITY STUDY

BELOIT CORPORATION ROCKTON FACILITY NPL SITE
ROCKTON, ILLINOIS

November 2001

Prepared by: Lisa A. Sanders — 11/28/2001
Lisa A. Sanders, Associate Engineer — Date

Prepared by: Matthew L. Narus — 11/28/2001
Matthew L. Narus, Associate Engineer — Date

Reviewed by: Bruce A. Iverson — 11-28-2001
Bruce A. Iverson, Supervising Engineer — Date

Approved by: Kenneth J. Quinn — 11/28/01
Kenneth J. Quinn, Project Manager — Date

N:\Jobs\208\2402\01\wp\rpt\99z_FS cover.doc

MWH
MONTGOMERY WATSON HARZA

November 28, 2001

Mr. Eric Runkel
Illinois EPA
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Re: Final Feasibility Study
Beloit Corporation Rockton NPL Site

Dear Mr. Runkel:

This final Feasibility Study for the Beloit Corporation, Rockton Facility NPL Site is submitted on behalf of Beloit Liquidating Trust. This Feasibility Study incorporates changes made as a result of the comments received (through an IEPA letter dated October 3, 2001) on the August 2001 version. Responses to these comments were submitted to the IEPA in a letter dated November 9, 2001. We are submitting three (3) copies of the Feasibility Study for your use and a copy of this Feasibility Study on CD as an Adobe Acrobat *.pdf file and Microsoft suite files. The drawings were not converted to a Microsoft compatible file, but are included in the pdf file.

If you have any questions, please do not hesitate to contact us.

Sincerely,

MWH

Kenneth J. Quinn, P.G.
Project Manager

Enclosures: Final Feasibility Study (3 copies)

cc: Mr. Jack Fishman – Beloit Liquidating Trust (1 copy)
Mr. Doug McLeish - Beloit Liquidating Trust (1 copy)
Mr. Earl VanderWielen III – Mallory Properties (3 copies)
Mr. Kevin Phillips - Ecology and Environment (2 copies)
Mr. Jon Peterson - U.S. EPA (3 copies)
Ms. Eileen Furey - U.S. EPA (w/o enclousre)

MLN/ndj/KJQ
N:\Jobs\208\2402\01\wp\rpt\99_Runkel Cov Ltr.doc
2082402.01180101 MAD-1

One Science Court
P.O. Box 5385
Madison, Wisconsin
53705-0385

Tel: 608 231 4747
Fax: 608 231 4777

Delivering Innovative Projects and Solutions Worldwide

TABLE OF CONTENTS

LIST OF TABLES

LIST OF DRAWINGS

LIST OF APPENDICES

Appendix

N:\Jobs\208\2402\01\wp\rpt\99x_FS toc.doc

LIST OF ACRONYMS

µg/L	micrograms per liter
1,1,1-TCA	1,1,1-trichloroethane
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
AOC	Administrative Order by Consent
ARAR	Applicable or Relevant and Appropriate Regulations
AWQC	Ambient Water Quality Criteria
BCRC	Beloit Corporation Research Center
BCP	Beloit Corporation Plant
bgs	below ground surface
BlRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cis-1,2-DCE	cis-1,2-dichloroethene
cm/s	centimeters per second
COPCs	chemicals of potential concern
cpm	counts per minute
CR	Cancer Risk
CVOCs	chlorinated volatile organic compounds
cy	cubic yards
DO	dissolved oxygen
EE/CA	Engineering Evaluation/Cost Analysis
FS	Feasibility Study
FSDA	Foundry Sand Disposal Area
FSSA	Fibered Sludge Spreading Area

ft.	feet
ft/day	feet per day
ft/min	feet per minute
gal	gallons
HEASTs	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
IAC	Illinois Administrative Code
IEPA	Illinois Department of Environmental Protection
in.	inches
IRIS	Integrated Risk Information System
ISCA	Interim Source Control Action
lbs	pounds
MCLs	Maximum Contaminant Levels
MSL	Mean Sea Level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCP	National Contingency Plan
ND	non-detect
NHPA	National Historic Preservation Act
NORM	naturally occurring radioactive material
NPL	National Priorities List
O&M	operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
PCBs	polychlorinated biphenyls
PCE	tetrachloroethylene
PID	photoionization detector
POTW	publicly owned treatment works
RAOs	Remedial Action Objectives
RCL	Residual Contaminant Levels

RCRA	Resource Conservation and Recovery Act
redox	reduction/oxidation
R_f	retardation factor
RfD	reference dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SFs	slope factors
sq. yd.	square yards
SVOCs	semivolatile organic compounds
SYA	storage yard area
TBC	to-be considered (requirements)
TCE	trichloroethylene
trans-1,2-DCE	trans-1,2-dichloroethene
U.S. EPA	United States Environmental Protection Act
VOCs	volatile organic compounds
yd^3	cubic yards

N:\Jobs\208\2402\01\wp\rpt\99_FS acronyms.doc

EXECUTIVE SUMMARY

INTRODUCTION

This Feasibility Study (FS) for the Beloit Corporation, Rockton Facility NPL Site has been prepared on behalf of Beloit Liquidating Trust which has been established pursuant to the confirmed Chapter 11 Bankruptcy Plan of Beloit Corporation and its liquidating debtor subsidiaries and is the transferee of all the assets and causes of action of Beloit Corporation and its liquidating debtor subsidiaries. References to Beloit Corporation or Beloit Corporation property as a current entity within this document refers to Beloit Liquidating Trust.

Beloit Corporation entered into a Consent Decree with the Illinois Environmental Protection Agency (IEPA), which became effective on October 17, 1991, and was amended on September 2, 1998, to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the site. The RI was submitted for Agency review and approved by the IEPA on September 16, 1999. The final Baseline Risk Assessment (BlRA) was approved by the IEPA on December 7, 2000. The data collected in the RI and throughout the operation of the interim source control action (ISCA) period is sufficient to evaluate remedial alternatives for the Beloit Corporation, Rockton Facility NPL Site.

This FS presents the evaluation of remedial alternatives specifically developed for the Rockton Facility NPL Site. The report provides background information and current site conditions. It also describes development of remedial alternatives and analyzes these alternatives following the procedure outlined in the NCP (40 CFR 300). Detailed design of a selected alternative will be developed during the Remedial Design phase, which is out of scope of the RI/FS consent decree.

BACKGROUND INFORMATION

Site Conditions

The shallow aquifer identified at this site consists of outwash deposits present above a lacustrine clay unit. Groundwater flow on the north side of the NPL site occurs towards the Rock River. This area is above the pool behind the dam on the Rock River, and is typical of areas along the river not affected by a dam.

Groundwater flow on the southern portion of the NPL site prior to an Interim Source Control Action (ISCA) was to the Rock River below the dam, south of the village. The groundwater high beneath the Beloit Corporation property is a divide between flow to the Rock River (to the northwest), and the Rock River below the dam (south of the village).

The RI characterized the groundwater quality on and downgradient of the NPL Site as containing VOCs in groundwater in 5 separate areas:

- PCE Plume – Central Beloit Corporation Property

- TCE Plume – South of Beloit Corporation Property
- Southern Blackhawk Acres Subdivision Wells
- Northern Blackhawk Acres Subdivision Wells
- Eastern Blackhawk Acres Subdivision Wells.

The RI identified a probable source of PCE on the Beloit Corporation property beneath the erection bay, located at the southwest corner of the plant. Intensive groundwater investigations prior to and during the RI have not identified sources of VOCs for the other areas of VOCs in the groundwater on and around the NPL site.

The distribution of VOCs in groundwater on and around the NPL site are characterized in three areas for the purpose of this FS. These three areas/plumes are entitled herein as:

- Groundwater VOC Source Area – on the Beloit Corporation property near the current location of the Erection Bay.
- On-Property Groundwater Plume – on the Beloit Corporation property. This area includes the groundwater described and entitled in the RI as the PCE Plume - Central Beloit Corporation property.
- Off-Property Groundwater Plumes – off the Beloit Corporation boundaries. This off-property area includes the Village of Rockton, to the south of the Beloit Corporation property and also south of the NPL site.

Baseline Risk Assessment

The summary of the Baseline Risk Assessment states that "Under current conditions excess lifetime cancer risks were below or within the $1x10^{-4}$ to $1x10^{-6}$ risk range, and non-cancer hazard indices were at or below 1 for all potential exposure pathways and populations evaluated in the BIRA. Only under hypothetical future scenarios is there the potential for an excess lifetime cancer risk $>1x10^{-4}$ or a hazard index >1 in the future".

The future hypothetical scenario that would exceed the cancer risk of $1x10^{-4}$ was if the three residents in the Blackhawk Acres Subdivision (910, 914, and 9180 Watts Avenue) that have had VOCs detected in their wells used untreated groundwater, with the historically highest concentrations, for domestic use. Future hypothetical scenarios that exceeded both the cancer risk index of $1x10^{-4}$ and the non-cancer hazard index of 1, were the following:

- If one or more of the nine private wells in the Village of Rockton became affected with similar concentrations of VOCs as found on-site.
- If future residential development occurred on the Beloit Corporation Property and untreated shallow groundwater was used for domestic purposes.

- If future employees worked exclusively (250 days/yr) in areas with contaminated surface soils.

These hypothetical scenarios, required to be discussed in the BIRA and this document, are provided as information only and not expected to occur.

FEASIBILITY STUDY

This FS describes the development and analysis of remedial alternatives. The identification and screening of technologies (Section 4) presents the steps from identifying the media of concern through evaluating and selection of process options for these media of concern. As described above, there are three media of concern identified at the site. They are the Groundwater VOC Source area (i.e., the area near the erection bay on the Beloit Corporation property that is shown to be the source of PCE on the Beloit Corporation property), the On Property Groundwater Plume, and the Off Property Groundwater Plume.

Remedial Action Objectives (RAOs) are developed for each of the three media. Based on the volumes and area of the three media of concern, remedial technologies and process options are screened, then evaluated and selected.

Using the selected process options, seven (7) remedial alternatives are developed in Chapter 5. These alternatives are:

- Alternative 1 – No Action
- Alternative 2 – On Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control
- Alternative 2a: On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat
- Alternative 3: Source Treatment and Off-Property Groundwater Plumes Exposure Control
- Alternative 3a: Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
- Alternative 4: On-Property Groundwater Pump and Treat, Source Treatment and Off-Property Groundwater Exposure Control
- Alternative 4a: On-Property Groundwater Pump and Treat; Source Treatment, and Off-Property Groundwater Pump and Treat

The detailed analysis of these alternatives is conducted using 7 of the 9 criteria specified in the U.S. EPA RI/FS Guidance and is presented in Section 6. The remaining two criteria, state and community acceptance, are left for consideration in the Record of Decision.

The comparison of alternatives, presented in Chapter 7, uses a numerical scoring of the alternatives, again using 7 of the 9 criteria. The alternatives that emerged with the best numeric ratings, indicating the most favorable alternatives, were:

- Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the highest rating of 56.3.

- Alternative 3 – Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 55.3.

N:\Jobs\208\2402\01\wp\rpt\99_FS Exec.doc

1.0 INTRODUCTION

This draft Feasibility Study (FS) for the Beloit Corporation, Rockton Facility NPL Site has been prepared on behalf of Beloit Liquidating Trust which has been established pursuant to the confirmed Chapter 11 Bankruptcy Plan of Beloit Corporation and its liquidating debtor subsidiaries and is the transferee of all the assets and causes of action of Beloit Corporation and its liquidating debtor subsidiaries for the Beloit Corporation, Rockton Facility NPL Site. References to Beloit Corporation or Beloit Corporation property as a current entity – within this document refers to Beloit Liquidating Trust (commonly referred to as the Blackhawk Facility) in Rockton, Illinois. Beloit Corporation entered into a Consent Decree with the Illinois Environmental Protection Agency (IEPA), which became effective on October 17, 1991, and was amended on September 2, 1998, to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the site.

The RI/FS is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA generally requires that the lead agency evaluate alternatives for site remediation. Such remedial measures must, to the extent practicable, be in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), which contains provisions for implementing the requirements of CERCLA. The U.S. Environmental Protection Agency (U.S. EPA) has provided interim guidance for conducting an RI/FS in its guidance document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988).

The process for conducting the RI/FS and selecting remedial measures consists of four major elements:

- Remedial Investigation (RI) - During the RI, data is collected to assess site conditions, including the extent of releases from the site and the character of source materials. Data on releases are evaluated to assess the potential effects on public health and the environment.

- Baseline Risk Assessment (BlRA) – In the Baseline Risk Assessment, the data collected during the RI phase is used to determine the potential exposure pathways and chemicals of concern. Also in the BlRA, the potential risks associated with each pathway and chemical are calculated.

- Feasibility Study (FS) - In the FS, a number of potential remedial alternatives are developed, evaluated against a range of factors, and compared to one another. The evaluated remedial alternatives should be sufficient to address and mitigate the risks presented in the BlRA.

- Selection of Remedy - The IEPA indicates a preference for a particular remedial alternative, and prepares a Proposed Plan for the site. This plan, together with the

RI and FS reports, and other related documents, is placed in the Administrative Record for review by the public. The IEPA makes a final selection of the remedy for the site after the comments are reviewed and addressed. The selection is documented in the Record of Decision (ROD).

The RI was submitted for Agency review and approved by the IEPA on September 16, 1999. The final BlRA was submitted for Agency review on November 13, 2000, and approved by the IEPA on December 7, 2000. The data collected in the RI and throughout the operation of the interim source control action (ISCA) period is sufficient to evaluate remedial alternatives for the Beloit Corporation, Rockton Facility.

This document presents the evaluation of remedial alternatives specifically developed for the Rockton Facility NPL Site. This FS provides background information and current site conditions. It also describes development of remedial alternatives and analyzes these alternatives following the procedure outlined in the NCP (40 CFR 300). Detailed design of a selected alternative will be developed during the Remedial Design phase.

1.1 REPORT ORGANIZATION

In addition to this Introduction, this report includes the following sections:

- Section 2 provides information about the site, including site description and history. More detailed information can be found in the RI (Montgomery Watson, 1999a).
- Section 3 summarizes the results of the RI and the BlRA's chemicals of potential concern (COPCs). More detailed information can be found in the RI (Montgomery Watson, 1999a) and BlRA (Montgomery Watson, 2001).
- Section 4 begins the FS element of the CERCLA process and provides a description and summary of technology screening.
- Section 5 presents the development of alternatives by assembling a limited number of viable technologies identified through the screening process. These preliminary remedial action alternatives are subjected to additional definition and analysis prior to detailed evaluation.
- Section 6 provides a description and detailed analysis of the developed alternatives addressing seven of the nine alternatives set forth in the NCP.
- Section 7 provides a comparative analysis of the strength and weakness of each of the alternatives relative to one another with respect to the NCP criteria.
- Section 8 lists the references cited in this report.

2.0 BACKGROUND INFORMATION

This section summarizes background information about the Beloit Corporation, Rockton Facility (i.e., Blackhawk Facility), including site description and history, and regional information. The information presented in this section is based on information provided in the RI Report (Montgomery Watson, 1999a) and in the BIRA (Montgomery Watson, 2001).

2.1 REGIONAL LOCATION AND SITE DESCRIPTION

The Beloit Corporation, Rockton Facility is located in Rockton Township, in north central Illinois (Drawing A1). The NPL Site lies in a mixed industrial and residential area adjacent to and within the Village of Rockton. The NPL Site occupies part of the northern half of Section 13 and the southeast quadrant of Section 12, T46N, R1E, Winnebago County, Illinois.

The NPL Site, as defined by the Consent Decree, is bounded on the north by Prairie Hill Road, on the west by the Rock River, on the south by a line projected from the Rock River along the south edge of a Village of Rockton easement and access road for the village water tower to Blackhawk Boulevard, and on the east by Blackhawk Boulevard. The NPL Site area includes Beloit Corporation property, the neighboring Blackhawk Acres subdivision, the former Soterion/United Recovery facility (Soterion), a portion of the Taylor, Inc. property, and the Safe-T-Way property (Drawing A1). According to the IEPA, the NPL site is defined by the extent of contamination, and thus is not fixed to these boundaries.

2.2 SITE HISTORY

2.2.1 Historical Use of the Site

The Beloit Corporation property was farmland prior to 1957. In 1957, Beloit Corporation bought the property and began construction of various portions of the facility in numerous stages since that time. Currently the facility is closed pending transfer to other industrial uses.

Solvents were used at the plant for parts cleaning operations. Non-chlorinated solvents were used at the facility until the mid 1970's. From the mid 70's until 1983, chlorinated volatile solvents were used. These solvents were stored off-site and brought to this facility on an as-needed basis. The exact composition and volume of the chlorinated solvents used is unknown. From 1982 until the facility was closed in 1999, mineral spirits were used for metal degreasing and parts cleaning.

Soterion is located at the southern limit of the Blackhawk Acres subdivision (see Drawing A1). The operations formerly conducted at this site consisted of 4 quonset huts where waste cuttings from metal fabricating operations were process before being recycled. Complaints of poor waste handling practices and detections of elevated volatile organic compound (VOC) levels in many of the homes located on Watts Avenue near Soterion prompted the IEPA to conduct investigations from 1980 through 1982. During their inspections, the IEPA documented releases of waste oils on the Soterion grounds through their septic system and in a dry well located in front of the Soterion building at 900 Watts Avenue.

Safe-T-Way is a small manufacturing facility located on the cul-de-sac of Blackhawk Blvd., in the southeastern area of Blackhawk Acres subdivision. Safe-T-Way manufactures small explosion proof containers for gasoline and other flammable liquids.

Taylor, Inc. is a large manufacturing facility located south of the Blackhawk Acres subdivision. Only the northern portion of Taylor, Inc. is located within the NPL site, as defined by the U.S. EPA and the IEPA. Taylor, Inc. manufactures refrigeration units for commercial applications. According to the IEPA (personal communication with Eric Runkel), Taylor, Inc. used small quantities of TCE and reportedly did not dispose of the TCE on their property.

2.2.2 Previous Investigations

Numerous investigations have been conducted both within and outside the boundaries of the NPL site. The four general phases of investigations are documented in the Technical Memorandum reports 1-4 (Warzyn, 1993; Montgomery Watson, 1995, 1997, and 1998).

In summary, the four phases of investigation conducted during the Remedial Investigation period since the Consent Decree in 1991 have focused on the objectives of:

- Assessing the nature and extent of contamination;
- Identifying source areas;
- Providing information for assessing the risks, both human and ecological, posed by the contamination (i.e., completing the final BIRA); and,
- Providing information for the evaluation of remedial alternatives (i.e., completing the FS).

Results of these investigations are described in detail in the RI Report and are summarized in Section 3 of this report.

2.2.3 Previous Response Actions

In April 1996, the IEPA issued an Action Memorandum for Beloit Corporation to implement an Interim Source Control Action (ISCA) on the Beloit Corporation property. The Engineering Evaluation/Cost Analysis (EE/CA) (Montgomery Watson, 1995b) recommended, and IEPA approved, action was a groundwater pump and treatment system. This system is generally located in the southeastern corner of the Beloit Corporation property. The system is designed primarily for groundwater containment within the Beloit Corporation property. The Interim Source Control Action (ISCA) (i.e., the pump and treatment system) went on-line on July 2, 1996, as documented in the Removal Action Design Report (Montgomery Watson, 1996). This system has been in continuous operation since that time.

In addition to the ISCA treatment system, four residences (910, 914, 918 Watts Ave. and 1102 Blackhawk Ave.) within the Blackhawk Acres subdivision on the NPL site with private groundwater supply wells were identified as having VOC concentrations in excess of applicable maximum contaminant levels (MCLs). These residences had point-of-entry treatment systems installed in their homes in 1993. These systems have been maintained and monitored since that time by the IEPA.

Another private water supply well, located at 630 N. Blackhawk Dr., was also found to have VOC impacted water in 1998. This residence was connected to the Village of Rockton municipal water supply in 1999.

2.3 REGIONAL INFORMATION

2.3.1 Site Topography and Surface Features

Prominent features in and around the NPL site are shown on Drawing F2. In general, the site has very little relief, as is shown in Drawing A1. The area is the Rock River/Pecatonica River alluvial valley. Surface elevations in this area range from approximately 900 ft above mean sea level (MSL) at the top of the rolling uplands to less than 720 ft above MSL, where the Beloit Corporation property meets the southerly flowing Rock River. Upland features are primarily controlled by erosion and bedrock formations, while the valley is primarily post-glacial fluvial erosion and depositions.

Sand/gravel mining, building/road construction, and various disposal areas have altered the NPL site area. Disposal of foundry sand through operations at the facility created a mound, approximately 11 ft high, southwest of the Beloit Corporation property. Drawing F2 shows that the ground surface slopes gently from the gravel pit area located east of the Beloit Corporation Research Center (BCRC) toward the village to the south and toward the Rock River to the southwest and west. In the areas where site surface soils have been removed (gravel pit, site building footprints, paved areas, and storage yards), the exposed materials are mostly well-drained silty sands and gravels.

2.3.2 Surface Water Hydrology

The NPL site is bounded to the west by the Rock River. The bottomland (wetland) areas which compose the floodplain of the Rock River located on the west side of the Beloit Corporation property is considered a jurisdictional wetland. The surface water drainage on the Beloit Corporation property flows generally towards the Rock River and along the railroad corridor. The flow directions and drainage pathways are shown on Drawing F2.

The destination of most runoff in the area is the Rock River, which ultimately discharges in the Mississippi River. Only about 10% of local precipitation eventually enters the groundwater system (Berg, Kempton, and Stecyk, 1984). Groundwater generally flows from the uplands (recharge) down into the lowlands (discharge/recharge) and into the Rock River (discharge). Most water that infiltrates into the groundwater system in the lowland terrains will most likely move directly toward the rivers and into the surface water system.

2.3.3 Soils

The site soils are in general sandy loam in consistency with underlying sequences of glacial outwash deposits of sand, silty sand, sand and gravel, silty sand and gravel, lacustrine clays, and silts. These glacial deposits are between 220 and 235 ft thick and lie unconformably on the Platteville dolomite and St. Peter sandstone bedrock aquifers.

2.3.4 Regional Geologic/Hydrogeologic Settings

2.3.4.1 Regional Geology. The dissected bedrock topography in Winnebago County resulted primarily from fluvial erosional processes and, to a lesser degree, from erosional processes associated with the Pleistocene glaciation. The bedrock surface in Winnebago County is dominated by the Rock River Bedrock Valley and its two main tributaries, the Pecatonica and Sugar River Bedrock Valleys.

The Rock River Bedrock Valley is filled with up to several hundred feet of interbedded glacial sands, gravels, silts, and clays. Distribution of this valley train material was primarily controlled by the orientation of the bedrock valleys with respect to the direction of ice movement and the various ice front positions.

Drift thickness in the Rock River Bedrock Valley ranges between 200 and 250 ft in the north and is 250 ft in the south. In the Pecatonica/Sugar River Bedrock Valley, drift thickness is approximately 150 ft upvalley and 250 ft at the junction of the Pecatonica/Sugar and Rock River Bedrock Valleys.

The succession of bedrock units that subcrop beneath Winnebago County generally dip to the southeast. They are, in order of increasing age and increasing depth, the Galena group, Platteville group, and the Ancell group. The Galena group is beneath most of southern and eastern Winnebago County and reaches a maximum thickness of 250 ft in the southern portion of the county. The Platteville group is generally finer grained and thinner bedded (100 ft in thickness) than the overlying Galena Group. It is the dominant surficial bedrock unit in northern Winnebago County and along the walls of the Rock, Pecatonica, and Sugar

River Bedrock Valleys. The Ancell group is comprised of the Glenwood Formation and the St. Peter sandstone. The Glenwood formation consists of interbedded dolomite, sandstone, and shale that, collectively, range from 5 to 60 ft in thickness where they have not been removed by erosion. The St. Peter sandstone is a fine to coarse grained sandstone that is characterized by a high percentage of well-rounded quartz grains. The average thickness of the Ancell group is 270 ft.

2.3.4.2 Regional Hydrogeology. The bedrock and glacial drift aquifers in Winnebago County provide significant quantities of water for industrial, private, and municipal use. Primary bedrock aquifers that subcrop beneath glacial drift are the St. Peter Sandstone and the Galena/Platteville dolomite. The Rock River Bedrock Valley glacial drift deposits are dominated by high capacity, thick sand and gravel aquifers, whereas, the Pecatonica/Sugar River Bedrock Valley glacial deposits are dominated by low capacity sand and silt bearing aquifers (Hackett, 1960).

2.3.5 Site Geologic/Hydrogeologic Setting

2.3.5.1 Site Geology. The NPL site is located over the ancestral Pecatonica/Sugar Rivers Bedrock Valley, where it merges with the Rock River Bedrock Valley. The glacial deposits beneath the NPL site consist of a coarse upper outwash, primarily in the vadose zone; a fine grained middle outwash, typically at or below the water table; and a coarse grained lower outwash, which is bounded below by a lacustrine clay deposit that extends laterally beneath the site. Soils in the upper 20 to 30 ft are dominated by coarse grained glacial outwash sands and gravels containing varying proportions of gravel, sand, silt, and clay. The observed depth to the base of this surficial outwash deposit ranges from 6.5 ft in well W17 to 50.0 ft in well W27.

The surficial outwash sand and gravel deposit is underlain by outwash deposits consisting primarily of silty fine to coarse sands with lenses of silt and clay. The depth to the top of this fine grained unit ranges from approximately 11 ft bgs at W33C to approximately 27 ft bgs at W25C. This silty sand unit is interbedded with and underlain by a sand deposit and a sand and gravel outwash deposit. Depths to the base of this lower sequence of outwash deposits range from approximately 90 ft at W26C to 52.5 ft at W50C. This outwash deposit extends laterally beneath the entire NPL site.

2.3.5.2 Site Hydrogeology. The shallow aquifer identified at this site consists of outwash deposits present above a lacustrine clay unit. The groundwater at the site and within the village of Rockton meets the standards of 35 IAC 620.210 Class I, Potable Resource Groundwater. The groundwater is more than 10 ft below ground, is within an unconsolidated sand and gravel, has less than 12% fines, is greater than 5 ft in thickness, will supply more than 150 gallons/day to a well, and has a hydraulic conductivity of greater than 1×10^{-4} cm/sec.

Groundwater flow on the north side of the NPL site occurs towards the Rock River. This area is above the pool behind the dam on the Rock River, and is typical of areas along the river not affected by a dam.

Groundwater flow on the southern portion of the NPL site prior to the ISCA was to the Rock River below the dam, south of the village. The groundwater high beneath the Beloit Corporation property is a divide between flow to the Rock River (to the northwest), and the Rock River below the dam (south of the village). It is important to note that the rate of recharge is not necessarily higher in this area. The divide occurs in this area because of the effect the dam has on surface water and groundwater levels.

The evaluation conducted for the ISCA during the Phase IV investigations indicated that groundwater extraction from well EW04 is having drawdown effects in the area of wells W18 and W50C, which are located in the southwestern portion of Blackhawk Acres subdivision. The capture zone of well EW04 extends past well W18 located in the Blackhawk Acres subdivision. Additionally, extraction well EW01 was installed in what was shown to be the source area of the PCE in groundwater to capture and cause drawdown effects on the groundwater in this area.

N:\Jobs\208\2402\01\wp\rpt\99_FS Sec 2 revised.doc

3.0 NATURE AND EXTENT

This section summarizes information contained in the RI (Montgomery Watson, 1999) and BIRA (Montgomery Watson, 2001) regarding the nature, extent, fate, and transport, and the human health and ecological risks potentially posed by COPCs. The following subsection summarizes information in the RI and presents the nature and concentrations of the COPCs in the various media investigated.

3.1 SUMMARY OF REMEDIAL INVESTIGATION

This section presents a brief overview of the nature and extent of COPCs in the site media which were sampled and evaluated during the RI and discussed in the BIRA. Included is a description of potential sources of impact to the environment by groundwater and surface/subsurface soils.

3.1.1 Groundwater Sampling Results

Groundwater quality samples were obtained throughout the NPL site and beyond the NPL site boundaries during the RI. Groundwater sampling is continuing during the operation of the ISCA. During the RI, groundwater quality samples were analyzed for VOCs, chlorinated volatile organic compounds (CVOCs), semivolatile VOCs (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and indicator parameters. A summary of the results as described in Section 3.4.1 of the BIRA, of these numerous samples is given below (Montgomery Watson, 2001):

- Detections of SVOCs in both on and off-site wells were at low concentrations and are not considered as COPCs.
- Detections of pesticides in both on and off-site wells were at minor concentrations, and are not considered as COPCs.
- No PCBs were detected in groundwater both on and off-site.
- Metals detected in the on and off-site wells were detected at low concentrations and are randomly distributed. These constituents are not considered COPCs.
- Indicator parameters (i.e. alkalinity, nitrate + nitrite nitrogen, chloride, sulfates, total dissolved solids) were collected to characterize general water chemistry and are not considered COPC.
- The RI describes in detail the distribution of VOCs and potential source areas of these VOCs in groundwater. The primary VOCs detected were halogenated alkenes (PCE, TCE) and alkanes (1,1,1-TCA, 1,1-DCA). A summary of the distribution of

total VOCs in groundwater at the site, from three different dates, is shown on Drawings A2, A3, and A4, as maps of total chlorinated VOCs. Drawing A2 represents data between November 1996 and July 1997 (Phase II data), Drawing A3 represents data from April 1998, and Drawing A4 represents data from January 2001. These maps use the maximum concentration at each well nest and do not discriminate between the presence of PCE, TCE, and other VOCs or the sources of these VOCs. The vertical extent of CVOCs is limited to the sand and gravel overlying the clay present at a depth of 56 ft to 90 ft on the NPL site.

The change in CVOC plume size and concentrations between Drawings A2 and A3 shows that the center of the groundwater plume (i.e., the 100 μg/L concentration contour) near the south end of the NPL site has been disconnected (likely due to the operation of the ISCA treatment system) and has migrated toward the central portion of the village. This data supports the measured groundwater flow direction and gradient discussed in Section 2.3.5.2, which is southerly towards the Rock River on the downgradient side of the dam. The data also supports the groundwater migration rate in this area is up to 600 ft in approximately 2 years.

The distribution of VOCs in groundwater on and around the NPL site are characterized in three areas for the purpose of this FS. These three media incorporate the five separate areas of VOCs identified in Section 4.3.2.2 of the RI report (Montgomery Watson, 1999). These three areas/plumes are entitled herein as:

- Groundwater VOC Source Area – on the Beloit Corporation property near the current location of the Erection Bay.

- On-Property Groundwater Plume – on the Beloit Corporation property. This area includes the groundwater described and entitled in the RI Section 4.3.2.2 as the PCE Plume - Central Beloit Corporation property.

- Off-Property Groundwater Plumes – off the Beloit Corporation and/or NPL site boundaries. This off-property area includes the Village of Rockton, to the south of the Beloit Corporation property and also south of the NPL site. This area includes the following groundwater plumes described and entitled in the RI Section 4.3.2.2 as the:

    - TCE Plume Southern Wells South of the Beloit Corporation property

    - The portion of the PCE Plume-Central Beloit Corporation Property that extends south of the NPL Site

    - Southern Blackhawk Acres Subdivision Wells.

The VOCs in the Groundwater VOC Source Area, On-Property Groundwater Plume and Off-Property Groundwater Plumes are discussed further in the subsections below.

3.1.1.1 Groundwater VOC Source Area. The source area of PCE consists of the area on the Beloit Corporation property described in the RI (Section 4.3.2.2). Based on the presence of PCE in the soils above the water table and the concentration and distribution of PCE in the groundwater, the source area of the On-Property Groundwater Plume has been shown to be located at the erection bay area (near well W23). The area defined as having CVOCs in excess of 1,000 μg/L in groundwater based on lab and field screening results is estimated to be approximately 100 feet by 120 feet, bounded to the west by W36C, to east by SB33, the south by SB36A, and to the north SB32.

3.1.1.2 On-Property Groundwater Plume. The On-Property Groundwater Plume consists of the area on the Beloit Corporation property described in the RI (Section 4.3.2.2) as the PCE Plume Central Beloit Corporation Property. The VOCs consist primarily of PCE, with small percentages of TCE and cis-1,2-dichloroethene (1,2-DCE) as degradation products of PCE, and low concentrations of 1,1,1-trichloroethane (1,1,1-TCA).

The PCE released in the vicinity of the Beloit Corporation erection bay is present in the groundwater below the Beloit Corporation property. For the purposes of this FS, this PCE groundwater plume under the Beloit Corporation property is defined as the On-Property Groundwater Plume. 1,1,1-TCA, TCE, 1,1-DCE, and 1,2-DCE are also present and migrating in groundwater below the Beloit Corporation property. The current, contiguous downgradient limit of this plume is shown to be to extraction well EW03, and the plume is shown to be contained by the ISCA and cutoff from the off-property groundwater plumes (see Drawings A3 and A4). Prior to operation of the ISCA (Drawing A2), the plume was shown to extend to W43C and potentially to the locations of wells W47C and W48C.

3.1.1.3 Off-Property Groundwater Plumes. The Off-Property Groundwater Plumes consist of the plumes/areas described and entitled in the RI (Section 4.3.2.2) as the:

- TCE Plume Southern Wells South of the Beloit Corporation property,
- PCE Plume-Central Beloit Corporation Property including only the portion that extended south of the NPL Site.
- Southern Blackhawk Acres Subdivision Wells.

The TCE Plume consists primarily of TCE, with minor concentrations of 1,1,1-TCA, PCE, and 1,1-DCE. The source of the TCE Plume, while unknown, is shown to be upgradient of wells W43C, W26C, and W18. The TCE present at well W21B does not appear to be upgradient from the TCE present at these wells. Extensive sampling of soils and groundwater in these areas do not show residual TCE to be present in the soils. This indicates there is evidence that a release of TCE occurred in this area.

The characteristics of the PCE Plume are described in the previous section, 3.1.1.2 On-Property Groundwater Plume.

The VOCs detected in the Southern Blackhawk Acres subdivision wells (i.e., 910 Watts, 914 Watts, and 918 Watts) are primarily PCE and 1,1,1-TCA. As described in the RI, Investigations conducted during the RI have not identified the source of the VOCs at these private wells. However, declining concentrations of VOCs in the wells sampled, as described in the RI indicate that the source of PCE and 1,1,1-TCA to these wells is dissipating (Montgomery Watson, 1999). The extent of VOCs in this area is delineated by the surrounding private well sampling results. This includes private wells to the north on Watts Ave. (e.g., 1004 Watts) where no PCE was detected and to the east where low or no PCE was detected (e.g., 905 and 909 Watts). Well W44C and well nest G103S/G103D/W18 did not detect PCE to the east or west of these private wells. Well W50C, located to the south of well W18 detected a minor amount of PCE.

Two areas of VOCs on the NPL site are not included in the Off-Property Groundwater Plumes for purposes of this FS. These areas include the VOCs present in the northern portion of the subdivision and the VOCs detected at 1102 Blackhawk Ave (eastern portion of the subdivision). The VOCs present in the northern portion of the subdivision were historically limited to chloroform, centered at 1310 Blackhawk Ave. However, there was no chloroform detected during recent sampling of this well and the source is believed to have dissipated. In addition, the chloroform is unrelated to the VOCs present on the Beloit Corporation property. The RI attributes the source to a domestic source (i.e., septic tank, swimming pool, etc.) in the vicinity of 1310 Blackhawk Avenue. Therefore, this area is not included in the Off-Property Groundwater Plumes.

An isolated occurrence of TCE and low concentrations of 1,1,1-TCA and 1,1-DCA was detected at 1102 Blackhawk Ave. The extent of these VOCs was limited to this single private well. No VOCs were detected at 1102 Blackhawk Ave. from the February 1999 sampling round (Montgomery Watson, 1999). Previously, a downgradient private well (1012 Blackhawk Ave.) had lower concentrations of the same compounds and TCE was not detected in groundwater directly upgradient of 1102 Blackhawk Ave. The source of the TCE is believed to be very local and the lack of a detect in 1999 shows that this plume is dissipating. Therefore, this area is not included in the Off-Property Groundwater Plumes.

3.1.2 Surface/Subsurface Soils and Sediments Results

The extent of VOCs in surface soils, subsurface soils, and sediments has been sufficiently defined for purposes of this FS. Metals detected in these soils and sediments were in low concentrations, in concentrations that only slightly exceeded background levels for the area, or were randomly detected such that source areas could not be defined. A detailed description of the extent of soil VOC detections is given in Sections 4.2.1, 4.2.2, and 4.3.1 of the RI (Montgomery Watson, 1999). The extent of VOCs in soils were determined by the following observations:

- The highest concentrations of PCE detected in soils occur directly above the zone of the highest PCE in groundwater near the erection bay at the Beloit Corporation property (well W23). PCE concentrations in soil from the erection bay that indicate the presence of a VOC source for PCE included detections at SB30 of 76 ug/kg at 17 ft bgs and at SB35 at 170 ug/kg at 13 ft. The only other VOCs detected in subsurface soil samples are 1,2-DCE (SB33 erection bay at 24 ft., 4 ug/kg), xylenes (SB20 scrap metal storage area, at 3 ft bgs, 250 ug/kg), and ethylbenzene (SB20 scrap metal storage area, at 3 ft bgs, 8 ug/kg). No TCE or significant concentrations of other VOCs were detected at the Beloit Corporation property. Therefore, the release appears to have contained PCE only, with no TCE.

- The residual PCE concentrations within the unsaturated zone at the erection bay are very low. Grain size analyses show sand and gravel contents typically greater than 90% to 95%. These soils are very coarse with little moisture retention and VOC attenuation capacity. Therefore, only low concentrations of VOCs are retained in these soils.

- The higher PCE concentrations detected in the deeper finer grained soils at or near the water table at the point of release were greater than in the overlying coarse soils. These soils are finer, silty sand soils, with a much greater fines content, typically greater than 30% silts and clays, compared to less than 5% to 10% in the overlying soils. These finer grained soils have a higher moisture retention capacity and greater attenuation capacity than the overlying coarse grained soils.

- There were no other residual VOCs detected in soils from soil gas, surface soil or sediment sampling during the RI which would constitute a source of VOCs to groundwater.

A survey of naturally occurring radioactive material (NORM) was requested by the IEPA to be conducted over the FSDA. This survey was conducted in March of 2001 and the results are presented in a memo included in Appendix B. These results indicate that concentrations of NORM above background was not detected in this area of the site, and in general NORM readings were less than background soil readings. Based on these results, NORM is not considered a COPC for this site.

3.1.3 Site Specific Transport Processes

This section provides a summary of the fate and transport of the constituents of concern at the NPL site. The fate and transport of VOCs in soil and groundwater are important factors in the evaluation and selection of potential remedies.

3.1.3.1 Advection. Advection is the migration of VOCs with the movement of groundwater. Prior to operation of the ISCA, groundwater flow on the NPL site was generally flowing to the southwest and west. Groundwater below most of the NPL site ultimately discharges to the Rock River, south of the village. VOCs in groundwater are shown to be present on the Beloit

Corporation property originating from the erection bay area, as mentioned above. VOCs (primarily TCE) from other, unknown sources are also present within the Blackhawk Acres subdivision, in the southeast corner of Beloit Corporation property, and south of the Beloit Corporation property in the deeper portion of the shallow aquifer.

The rates of groundwater flow on the Beloit Corporation property, prior to the installation of the ISCA, varied from 0.26 ft/day to 3.1 ft/day. South of the NPL Site, groundwater flow rates are estimated to range from 0.23 ft/day to 1.10 ft/day. Adjacent to the site, in the influence of extraction well EW04, groundwater flow may be reversed or slowed down. Flow rates for the majority of the plume south of the site is unaffected by the ISCA treatment system. The rates of VOC migration will be affected by sorption, as discussed in the next section.

After implementation of the ISCA, groundwater flow on the Beloit Corporation property and along the southwest side of the Blackhawk Acres subdivision is shown to be intercepted by the extraction wells on the Beloit Corporation property. Groundwater VOCs within the capture zone of the ISCA are being removed and treated by air stripping. VOCs in groundwater outside the capture zone will continue to migrate and discharge into the Rock River south of the village.

3.1.3.2 Sorption of Organic Compounds. The retardation factor (R_f) for the constituents of potential concern range from 1.2 to 5.5. Therefore, VOCs will move 1.2 to 5.5 times slower than the migration of the groundwater flow rate. Given the range of groundwater flow rates on the NPL site, VOC migration rates range between 0.22 ft/day and 2.6 ft/day ($R_f = 1.2$) to 0.05 ft/day and 0.57 ft/day ($R_f = 5.5$). The range of groundwater flow rates south of the NPL site of 0.23 ft/day to 1.10 ft/day result in VOC migration rates from 0.20 ft/day and 0.92 ft/day ($R_f = 1.2$) to 0.04 ft/day and 0.20 ft/day ($R_f = 5.5$). A similar reduction occurs in the migration rate of VOCs to the extraction well when captured by the ISCA.

3.1.3.3 Biodegradation of Organic Compounds. There is the potential for biodegradation of chlorinated VOCs detected at the site. This degradation primarily occurs within the anaerobic environments of the subsurface. The rates of reaction can be relatively fast, compared with the rates of groundwater flow. However, based on the distance the constituents have migrated, it is apparent that the rate of groundwater flow is greater than the rate of degradation. Therefore, no data was collected to characterize zones of anaerobic environments, where degradation of CVOCs typically occurs or to document the rate of natural degradation occurring in the identified groundwater plumes. As concentrations decline, the effect of degradation on future concentrations may be of importance, and data quantifying natural degradation rates may be collected at the time when site closure is pursued.

3.1.3.4 Surface Water and Sediment. Surface water can be a migration pathway when precipitation comes in contact with soils containing COPCs on the Beloit Corporation property. However, on the Beloit Corporation property there are no constituents of concern present in the near surface soils. Therefore, release of VOCs or SVOCs to surface water through direct contact and runoff is not of concern at this site.

Surface waters may become affected, though, when they receive an influx of groundwater with VOCs. As mentioned previously, final discharge of groundwater within the NPL site, will eventually be to the Rock River, south of the village. Discharge of VOCs in groundwater to the river, directly west of the erection bay, has not been shown to occur.

The estimated potential groundwater and VOC discharge rates from the VOC plume to the Rock River are 12,000 ft^3/day (0.138 cfs) and 0.1 lb/day. These are based on the estimated groundwater flow rates, the estimated VOC plume width and thickness, and a maximum VOC concentration of 180 µg/L in groundwater. Due to dilution from the large flow within the Rock River, this discharge would have a dilution factor of 22,500 applied to it upon reaching the river. Thus, VOC loading to the Rock River from groundwater discharge is not expected to be significant.

3.1.3.5 Volatilization to the Atmosphere. Air can be a migration pathway if volatile contaminants in the soil are transferred to the soil vapor phase, then diffuse through the pores of the soil, and finally are emitted to the atmosphere. However, as discussed previously, the source of VOCs at the Beloit Corporation property erection bay is now covered by a building and asphalt driveway. In addition, the concentration of the VOCs present in the soils is relatively low. Therefore, emissions at the source area are not considered to occur.

The current ISCA includes an air stripper that treats groundwater through air stripping. This process transfers VOCs in the water to the air. The air discharge from this system has been shown to be minimal (Montgomery Watson, 1995) and significantly less than the regulatory limit of 8 lb/day. This rate does not require an air permit and does not represent a significant source of VOCs to the atmosphere.

3.2 BASELINE RISK ASSESSMENT

As stated in the NCP, the purpose of the Superfund program is to protect human health and the environment from current and potential substance releases. For this reason, a Baseline Risk Assessment (BlRA) was conducted to determine if the NPL Site potentially poses unacceptable levels of risk to human health and the environment. The BlRA was conducted in accordance with Subpart E, Section 300.430(d) of the revised NCP as promulgated on March 8, 1990. It was conducted to characterize the current or potential threat to human health and the environment that may be posed by chemicals originating at or migrating from the NPL Site in the absence of remedial (corrective) action.

3.2.1 Selection of Chemicals of Potential Concern (COPCs)

The BlRA was based on data and information regarding the site and surrounding area obtained primarily during the RI. Using this information, the first step of the assessment was to select COPCs for detailed evaluation. The selection of COPCs consists of a review of the RI data for the media sampled, and a determination of the chemicals which are present at the site above background concentrations. The background concentration for a specific chemical is defined as that which is typical for areas near the site, but that have not been impacted by the site. COPCs (i.e., those above background) are carried through the risk assessment for quantitative risk estimation with the human health evaluation. Based on these evaluations, numerous COPCs were selected for detailed assessment in the BIRA. These chemicals include those most likely to be of concern to human health and the environment, and do not include those chemicals not detected in the given media, chemicals removed due to blank contamination, or chemicals removed because they are essential human nutrients (i.e. calcium, iron, magnesium, potassium).

For each chemical of potential concern, toxicity information was then compiled. This included brief descriptions of the potential toxicity of each chemical to human health and quantitative toxicity criteria used to calculate risks. The toxicity criteria were primarily obtained from U.S. EPA's Integrated Risk Information System (IRIS) (U.S. EPA, 1996) and Health Effects Assessment Summary Tables (HEASTs) (U.S. EPA, 1994).

In the ecological assessment, an additional step was employed in order to limit the number of COPCs to a few indicator chemicals. The toxicity, concentration, and bioconcentration potential of each chemical were considered to select the indicator chemicals which would represent the greatest potential ecological concern (i.e., worst case). As a result of this analysis, numerous chemicals were selected as indicator COPCs for the ecological assessment.

Table 3-1 gives the complete list of the chemicals detected at the Beloit Corporation, Rockton Facility NPL Site. These are possible COPCs depending on the concentration present in the media described by the pathways identified in the following section.

3.2.2 Exposure Assessment

An exposure assessment was conducted to identify potential pathways of concern to human health under both current and future site and surrounding land use conditions. The following pathways, as summarized in Table 3-2, were selected for detailed evaluation under current land use conditions:

- Residential groundwater use from a private well from within the northern portion of the Blackhawk Acres subdivision.

- Residential groundwater use from a private well from within the other portions of the Blackhawk Acres subdivision.

- Incidental ingestion and dermal absorption of chemicals from surface water by children swimming in the Rock River in the groundwater discharge zone, located south of the Village of Rockton (off the NPL site).

- Incidental ingestion and dermal contact with sediment by children trespassing and playing along the banks of the Rock River adjacent to the Beloit Corporation property.

- Incidental ingestion and dermal contact with surface soil by children trespassing on the Beloit Corporation property.

- Incidental ingestion, inhalation, and dermal contact with surface soils and inhalation of fugitive vapors by Beloit Corporation employees working in areas of exposed soils.

- Incidental ingestion, inhalation, and dermal contact with surface and subsurface soils and inhalation of fugitive vapors by construction workers digging in soils on the Beloit Corporation property.

Under future land use conditions, the following hypothetical pathways were selected for evaluation:

- Use of groundwater from a private well south of the Beloit Corporation property.

- Use of groundwater from a private well within the southern Blackhawk Acres subdivision.

- Use of groundwater from a private well within the eastern Blackhawk Acres subdivision.

- Exposure to soils with COPCs by Beloit Corporation or other future site employees working in areas of exposed soils.

- Exposure to soils with COPCs by construction workers digging in soils on the Beloit Corporation property.

In the ecological assessment, exposure pathways were assessed on the basis of current site conditions. Under future site conditions, the potential for ecological receptor exposure was not anticipated to change (i.e., become greater), compared to current site conditions.

For a person or ecological receptor to become exposed to a chemical, there must be a medium containing the COPCs and a means by which the person, plant, or animal might become exposed to this medium. Persons and animals may be exposed to media containing COPCs in the environment through three main routes of exposure (i.e., ingestion, inhalation, and/or dermal contact). Plants may be exposed to COPCs through two primary routes of exposure (i.e., direct contact with its medium and stomatal conductance). The course a chemical takes from its source to a receptor is defined as an exposure pathway. If both a chemically impacted medium exists and means of receptor exposure is present, then the particular exposure pathway is considered complete.

Another primary element of the exposure assessment is to quantify the magnitude of chemical exposure for complete exposure pathways on a body weight basis (mg chemical/kg body weight/day). Exposure estimates are calculated for each potentially exposed population (by media and route of exposure). Quantification of chemical exposure includes the following:

- Estimating the chemical concentration in impacted (or potentially impacted) media to which a receptor may be exposed.

- Estimating the amount of exposure a receptor may have with the media containing the COPCs on a daily basis.

- Estimating the duration and frequency of the exposure.

This information is integrated to calculate a receptor's average daily chemical intake during the period of exposure (e.g., 30 years).

Exposures to each of the above pathways were calculated. In accordance with U.S. EPA guidance, the baseline risk assessment examined a reasonable maximum exposure (RME) associated with each pathway of concern. RME risk estimates for future land use of a site, involving exposure pathways that are typically more conservative than current land use pathways, can provide an important basis for evaluating potential remediation of a site (U.S. EPA, 1990). The NCP defines "reasonable maximum" such that "only potential exposures that are likely to occur will be included in the assessment of exposure" (U.S. EPA, 1990). U.S. EPA risk assessment guidance further defines the RME to be "the highest exposure that is reasonably expected to occur at a site" (U.S. EPA, 1989). The RME is intended to place a conservative upper bound on the potential risks, meaning that the risk estimate is unlikely to be underestimated but it may be overestimated. The likelihood that an RME scenario may actually occur is probably small, due to the many conservative assumptions incorporated into the reasonable maximum scenario.

3.2.3 Toxicity Assessment

The key element of this component of the B1RA is to quantify the magnitude of the toxicity of each chemical of potential concern. In the human health evaluation, both noncancer-type and cancer-type (carcinogenic) effects of each chemical were assessed, because the means by which a chemical elicits noncancer- versus cancer-type effects are different. In the ecological assessment only noncancer-type effects are assessed, because cancer-type effects are not anticipated to have a substantial impact on ecological populations.

Quantitative estimates of a chemical's noncarcinogenic or carcinogenic potency developed by the U.S. EPA are used in the human health evaluation to quantify risks. These toxicity factors were presented in the BIRA for each of the exposure pathways and COPCs.

For human exposure, the U.S. EPA has developed estimates of safe upper limits of chemical intake which, if not exceeded, should not result in noncancer health effects (e.g., liver disease). These values are termed reference doses (RfDs). RfDs have been developed for both the oral and inhalation routes of exposure. Dermal RfDs are currently estimated based on the oral RfD and the chemical's oral absorption efficiency.

For human exposure, the U.S. EPA has also determined estimates of the potency of carcinogenic chemicals. These values are termed slope factors (SFs), and they relate a person's probability of contracting cancer with the magnitude of the person's chemical intake.

In the ecological assessment, modified RfDs are used to assess the toxicity of chemicals to terrestrial and wetland animal populations. Plant toxicity is based on visual observation. Aquatic animal toxicity is based on a comparison to safe surface water concentrations obtained from the literature or to U.S. EPA Ambient Water Quality Criteria (AWQC).

3.2.4 Risk Characterization

In this section of the human health evaluation and ecological assessment, estimates of exposure were compared with toxicity information to arrive at an estimate of potential risk. For noncarcinogenic effects, hazard quotients (HQs) are calculated. For a given exposure pathway, the HQs for all COPCs are added to arrive at a total. This value is referred to as the hazard index (HI) for the exposure pathway. If the HI (or HQ) exceeds unity (1), there may be a potential health risk associated with exposure via the particular pathway (or chemical) evaluated. For those media that pose a noncancer-type health risk (i.e., HI > 1), remediation may be required.

To evaluate potential carcinogenic effects, cancer risks (CR) were calculated in the human health evaluation for individual chemicals. Similar to noncancer risk estimates, cancer risks were summed for each chemical to arrive at a cumulative cancer risk for each exposure pathway. The cancer risk value is an estimate of an individual's lifetime likelihood of developing cancer over and above the existing background chance of developing cancer. For example, a cancer risk of 1×10^{-6} may be interpreted as an increased risk of one in one million of developing cancer over a person's lifetime. A cancer risk above 1×10^{-4} is considered by the U.S. EPA to be unacceptable and remedial measures maybe required in order to reduce the cancer risk below this level. For those media that pose a cancer risk between 1×10^{-4} and 1×10^{-6}, remediation may be required. The U.S. EPA (1991c) has stated that sites with an excess lifetime cancer risk less than 10^{-4} (1 in 10,000) generally do not warrant remedial action. It is important to note that the site risk manager and responsible regulatory agency may determine the appropriate risk goals for the site and that other factors (i.e., noncarcinogenic health risks and adverse environmental impacts) are also considered.

3.2.5 General Assumptions and Uncertainty Associated with the Baseline Risk Assessment

It is necessary to keep the results of the Baseline Risk Assessment in the proper context if they are to be used for risk management purposes. The risk assessment process incorporates numerous assumptions and uncertainties. The general approach to this uncertainty is to use conservative assumptions in estimating chemical exposures so that the cancer risks and noncancer health hazards estimates represent an upper-bound (e.g., maximums). Thus, calculated risk estimates are not to be construed to necessarily represent actual risks. Proper interpretation of health risk values requires consideration of the uncertainties and assumptions involved in the risk calculations.

The risk assessment uses hypothetical scenarios and conservative assumptions to quantify potential risks for current and future land uses which may or may not reflect actual risks. For instance, in the Baseline Risk Assessment it is assumed that chemical concentrations in the study area do not change over time. This is unlikely because biodegradation, volatilization, transport and other physical, chemical, and biological processes will likely diminish the chemical concentrations over time. Therefore, the estimated risks in this report may change (i.e., decrease) according to the fate and transport of chemicals.

A baseline risk assessment, based on U.S. EPA guidance documents, is required to make the following assumptions to estimate health risks:

- No corrective actions will take place.
- No groundwater use restrictions will be applied.
- There is the potential for future development of the site.

The reader should be aware that these assumptions dramatically affect the exposure scenarios (e.g., residential development versus commercial development) selected for a site, and the media (e.g., surface soils, groundwater, sediment, etc.) to which persons will be assumed to be exposed. This has a significant impact on the magnitude of the risk levels which are attributed to the site by the baseline risk assessment.

Most of the chemicals which resulted in risks above de minimis levels were based upon the maximum detected concentrations in a single well or sample. In addition, the U.S. EPA approach used to calculate RME pathways are likely to result in overestimation of risks. For example, assuming that individuals in the site area would engage in certain activities that would always result in exposure on a regular basis over many years is conservative. Similarly, assuming that a residence could be built on the site in the future is hypothetical. Finally, the toxicity criteria are extremely conservative. Most of the inputs into this analysis ensure that the resulting risks are unlikely to be underestimated and are likely to be overestimated.

3.2.6 Summary of Health Risks for Current Land Use Pathways - Human Health Evaluation

Table 3-3 presents the cumulative risks for those pathways that were considered to be appropriate for summation in accordance with U.S. EPA guidance for combining risks across exposure pathways (U.S. EPA 1988). The guidance states that one must "examine whether it is likely that the same individuals would consistently face the RME by more than one pathway".

The cumulative upper bound lifetime cancer risk and hazard index values presented in Table 3-3 can be put into context by considering U.S. EPA's OSWER Directive 9355.0-30 (U.S. EPA, 1991a) as follows:

> "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the noncarcinogenic hazard quotient is less than one, action generally is not warranted unless there are adverse environmental impacts. However, if MCLs or non-zero MCLGs are exceeded, action generally is warranted."

As shown in Table 3-3, none of the identified groups or individuals for current conditions had cumulative cancer risks greater than 1×10^{-4}. MCLs, cancer risk thresholds (i.e., $>10^{-4}$ risk values), and/or noncarcinogenic hazard quotient thresholds (i.e., >1) are exceeded for some of the identified media of concern at or downgradient of the site based on hypothetical future use scenarios. Action may be warranted based on these threshold exceedances. The identified remedial alternatives (Section 5) propose appropriate actions to mitigate the potential risks from media of concern identified at the site. The following subsections describe the calculated cancer risks levels for the groups or individuals in current conditions.

3.2.6.1 Northern Blackhawk Acres Subdivision Residents. These individuals had total cancer risks from the exposure to all potential media at a calculated cancer risk level of 5×10^{-5} and a HI of 0.6 indicating no anticipated noncarcinogenic health risks. These are residents with private wells and no point-of-entry treatment systems. In the risk analysis for these residents, chloroform was the major chemical of concern, and it was assumed that these residents were exposed to the chloroform at the maximum detected concentration from the RI through their drinking water for a total of 30 years. Recent sampling in this area, though, has shown that this chloroform has dissipated to levels below detection limits. Cancer risk contributions from the other media and potential exposure pathways was calculated, but was minimal in comparison to this risk.

3.2.6.2 Other Blackhawk Acres Subdivision Residents. These individuals had total cancer risks from the exposure to all potential media at a calculated cancer risk level of 1×10^{-5} and a noncarcinogenic health risk of 6×10^{-1}. These are residents in the central and southern portion of the subdivision with no point-of-entry treatment systems installed on their wells. In the risk analysis for these residents, TCE was the major chemical of concern, and it was assumed that these residents were exposed to the TCE at the maximum detected concentration from the RI through their drinking water for a total of 30 years. This is a very conservative assumption, since recent sampling in the monitoring wells around these residences has shown VOC (including TCE) concentrations much below the measured maximums from the RI. Cancer risk contributions from the other media and potential exposure pathways was calculated, but was minimal in comparison to the risk from the TCE exposure risk.

3.2.6.3 On-site Employees. These individuals had total cancer risks from exposures to site soils at a calculated cancer risk level of $2x10^{-6}$ and the noncarcinogenic health risk is $4x10^{-1}$. This risk level is calculated based on cumulative maximum potential exposures to all of the detected compounds in the site surface soils (those to a depth of 10 ft bgs). This is an unlikely scenario, since it would require that an employee work in the outdoors nearly exclusively and be exposed to disturbed (i.e. easily inhaled and ingested) soils impacted by the COPCs throughout his/her career. Likely risk levels for the conventional Beloit Corporation employee that works inside the facility, and may be outside for brief periods of times during a workday, would be expected to be much less than the calculated level.

3.2.6.4 Rock River Recreational Users. This category of individuals is for users of the Rock River that are exposed to the sediments containing the maximum measured concentrations of the chemicals detected during the RI in these sediments. The calculated cancer risk for these individuals is $2x10^{-6}$ and the noncarcinogenic health risk is $2x10^{-1}$. This exposure scenario is unlikely because it assumes maximum dermal absorption and ingestion of these sediments, and the exposure point concentration of TCE used for this analysis was only measured in one of the sediment samples. It is unlikely that all or even a majority of the Rock River sediments contain TCE or other VOCs at such elevated concentrations, based upon the sediment sampling results from the RI. Furthermore, degradation and surface water transport of the Rock River sediments over time will decrease the concentrations and disperse these sediments throughout the river basin to give a much lower average sediment VOC concentration.

3.2.6.5 Beloit Corporation Property Tresspasser. This category of individuals is for trespassers onto the Beloit Corporation property that would be exposed to the COPCs in the Beloit Corporation property surface soils. The calculated cancer risk for these individuals is $3x10^{-6}$ and the noncarcinogenic health risk is $3x10^{-1}$. It is important to note that this cancer risk scenario, as calculated, is quite unlikely. This scenario is similar in assumptions to the on-site employee scenario, where the child trespasser is assumed to be exposed to disturbed, easily ingested/inhaled soils that have concentrations of the chemicals of concern at the maximum levels as measured during the RI.

3.2.6.6 Construction Workers. This category of individuals is described as construction workers performing intrusive activities on-site, such as digging or excavating in areas of chemically impacted soils. Individuals that fit under this category are anticipated to have the greatest potential for chemical exposure compared to residents and on-site employees. Construction workers were assumed to contact and incidentally ingest surface and subsurface soil (0 to 10 ft) in areas of excavation. The calculated non-carcinogenic health index was less than one (HI = $2.4x10^{-1}$) indicating there would not be any anticipated non-carcinogenic health effects. The cancer risk was calculated to be $4.2x10^{-7}$ on the Beloit Corporation property and

$5.4x10^{-7}$ off the Beloit Corporation property. The main chemicals contributing to the potential risks for construction workers was benzo(a)pyrene and arsenic.

3.2.7 Summary of Health Risks for Hypothetical Future Conditions and Land Use

The following are the exposure pathways that are considered to be potentially complete under hypothetical future conditions and current land use on the NPL site according to the BIRA (Montgomery Watson, 2001). It should be noted that risks were evaluated using conservative assumptions for which a risk assessment was conducted. Potential future scenarios are described in the following sections and include the following:

- VOCs affecting one or more of the nine private wells in the Village of Rockton.
- Residents of the three homes in Southern and Eastern Blackhawk Subdivisions using affected groundwater without the point of entry treatment systems, currently supplied.
- Potential future employees at the Beloit Corporation property that may work more outdoors in areas adjacent to construction work.
- Potential future residents on the central Beloit Corporation property using the groundwater from within a VOC plume for general domestic uses.

3.2.7.1 Wells South of the Beloit Corporation Property (Village of Rockton). Currently no water supply wells (either private or municipal) are affected by the TCE and PCE present in groundwater in the village of Rockton. Groundwater flow carrying the VOCs has been shown to be moving south towards the Rock River. Therefore, it is not likely that the municipal water supply will be impacted by VOCs from these plumes in the future (which is located south-southeast of the site). However, the health risk assessment was conducted as if the VOC plumes were to migrate to one or more of the nine private wells remaining south of the site in the Village of Rockton (Montgomery Watson, 2001). If the groundwater at these private wells were affected at the maximum concentration detected in monitoring wells in the Village and used for all general domestic purposes (i.e., drinking, bathing) for 30 years, then the cumulative HI would equal 1.8 and the cumulative cancer risk would be equal to $2.8x10^{-4}$ (Montgomery Watson, 2001). Therefore, both non-cancer and cancerous effects are above the reasonable maximum exposure set by the U.S. EPA. The primary contaminants causing the increased HI are TCE and carbon tetrachloride, while TCE and 1,1-DCE had the greatest contribution to the level of cumulative cancer risk.

3.2.7.2 Southern Blackhawk Acres Subdivision Wells. Currently three private wells in the Southern Blackhawk Acres Subdivision have had PCE concentrations above the MCL. These wells (910, 914, and 918 Watts Avenue) have point of entry treatment systems that were installed, and are maintained, and monitored by the IEPA. Since the water is currently treated to remove VOCs prior to its use it does not pose a health concern. Although it is anticipated that the treatment systems will remain in place, a hypothetical scenario was assessed that assumed the point of entry treatment systems were not in place. This hypothetical scenario assumed that the residents would use the water a total of 30 years for all domestic water uses (i.e., drinking and bathing). The cumulative HI would equal 2×10^{-1} indicating no anticipated non-cancer health risks, however the cumulative cancer risk would equal 1.6×10^{-4} under this hypothetical scenario (Montgomery Watson, 2001). The primary contaminants contributing to the cancer risk estimates are 1,1-DCE and PCE.

3.2.7.3 Eastern Blackhawk Acres Subdivision Wells. One private well (1102 Blackhawk Avenue) within the Eastern Blackhawk Acres Subdivision had been found to contain water with TCE concentrations above the MCL. However, the 1999 sampling showed no-detection of TCE in the pre-treatment water. The IEPA installed a point of entry treatment system and continues to maintain and monitor it. In evaluating potential future risks it was assumed that the well had no point of entry treatment and that concentrations of TCE continued to be present. The assessment found that there were no anticipated cumulative noncarcinogenic (HI <1) or carcinogenic health effects ($CR < 10^{-6}$) (Montgomery Watson, 2001).

3.2.7.4 Future On-Site Employees. The health risk could increase for employees in the future if the areas in which they work are changed. The resulting exposure could increase to 100 percent being from contaminated soils. With this scenario the noncarcinogenic HI = 1.4 and the cancer risk was determined to be 8.6×10^{-6}. This analysis was made assuming that 100% of the chromium found in the soil was in the hexavalent state. Another potential increase in health risk for employees would be if they were working outdoors next to construction work increased from current conditions. In this scenario the employees would be subject to conditions similar to the construction worker scenario except with greater exposure frequency and duration. Using the conservative assumption that employees would only be exposed to the most contaminated soil the noncarcinogenic HI = 2.2 and the cancer risk was 3×10^{-5}.

3.2.7.5 VOC Source Area. Hypothetical residents on the Central Beloit Corporation Property. Currently there are no residential wells on the Beloit Corporation property and the property is zoned for commercial/industrial use. The water supply for the property is from a deep well that is unaffected by the shallow groundwater. For the purposes of this analysis it was assumed that future residents on the property would use water from the shallow groundwater source for all domestic water uses over a 30-year time period. Based on these assumptions noncarcinogenic and carcinogenic health effects would be anticipated (HI = 50; CR = 7×10^{-3}). General domestic use of this groundwater is unlikely and can be prevented using deed restrictions.

3.2.8 Summary of Health Risks – Ecological Assessment

Based on the results of the screening level ecological assessment, levels of analytes detected in wetland and terrestrial habitats would not be expected to pose a health concern to ecological receptors. For this reason, additional ecological risk assessment was not considered necessary for purposes of the BIRA.

3.2.9 Media of Concern Determined in the Baseline Risk Assessment

The summary of the Baseline Risk Assessment states that "Under current conditions excess lifetime cancer risks were below or within the $1x10^{-4}$ to $1x10^{-6}$ risk range, and non-cancer hazard indices were at or below 1 for all potential exposure pathways and populations evaluated in the BIRA. Only under hypothetical future scenarios is there the potential for an excess lifetime cancer risk $>1x10^{-4}$ or a hazard index >1 in the future".

The future hypothetical scenario that would exceed the cancer risk of $1x10^{-4}$ was if the three residents in the Blackhawk Acres Subdivision (910, 914, and 9180 Watts Avenue) that have had VOCs detected in their wells used untreated groundwater, with the historically highest concentrations, for domestic use. Future hypothetical scenarios that exceeded both, the cancer risk index of $1x10^{-4}$ and the non-cancer hazard index of 1, were the following:

- If one or more of the nine private wells in the Village of Rockton became affected with similar concentrations of VOCs as found on-site.
- If future residential development occurred on the Beloit Corporation Property and untreated shallow groundwater was used for domestic purposes.
- If future employees worked exclusively (250 days/yr) in areas with contaminated surface soils.

For the third scenario (i.e., future employees working continuously in areas with contaminated surface soils), as described in the final BIRA, the elevated risks for future employees assume that 100% of the chromium detected in the site surface soils is hexavalent chromium rather than trivalent chromium, which is a less toxic chromium species. In addition, it was assumed that future employees would be exposed to the most contaminated dust generated from construction areas around the site. These conservative assumptions likely overestimate the non-cancer risks associated with potential future employees exposed to surface soils and does not warrant further action or consideration in this FS. In light of this and the fact that the HI is only slightly greater than 1, surface soils were not considered a media of concern.

Based on the results of the Baseline Risk Assessment, groundwater in specific areas, on and off of the property was identified as the media of concern for this FS. Other media, including surface water, sediments, and surface soils were eliminated as media of concern based on the results of the BIRA. For this reason, attention to groundwater will be the focus of the FS and the remedial action objectives, outlined in Section 4.2, and the subsequent remedial alternatives identification and detailed analysis performed as part of the FS.

N:\Jobs\208\2402\01\wp\rpt\99_FS Sec 3 revised 2.doc

4.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The objective of the identification and screening of technologies process is to identify a manageable number of applicable remedial technologies which can then be assembled into the remedial action alternatives (see Section 5). This process consists of the following tasks:

- Identification of the media of concern
- Development of the remedial action objectives
- Development of general response actions
- Identification of the volumes or areas of the media of concern
- Identification and screening of remedial technologies
- Evaluation and selection of technology process options

The following subsections provide a discussion of each of these tasks.

4.1 IDENTIFICATION OF MEDIA OF CONCERN

The BIRA (summarized in Section 3.2) evaluated potential risks to human health and the environment for potential exposures to chemicals of potential concern detected at the site. This evaluation considered land use conditions as they currently exist and potential future land use conditions. Environmental media of concern may be considered those media associated with potential cancer risks greater than $1x10^{-4}$, potential noncancer health risks at levels of potential concern (i.e., a hazard index greater than 1), or those that do not meet an applicable or relevant and appropriate requirement (ARAR), provided ARARs have been established and are sufficiently protective.

As discussed in Section 3.2, although none of the identified media for current exposure conditions at the site had potential cancer risks greater than the threshold level of $1x10^{-4}$ or noncancer health risks with a hazard index greater than 1, three media were identified as media of concern for potential future uses:

- Groundwater VOCs Source Area (i.e., This includes the area that acted as a source of PCE to the groundwater. This is the southern area of the current erection bay of the BCP. No significant mass of VOCs are present in these unsaturated zone soils, so this source area does not include surface or subsurface soils as a contaminated medium. The area has the highest VOC concentrations in groundwater within an area of lower hydraulic conductivity soils. Therefore, this area below the water table with lower hydraulic conductivity soils and the highest VOC concentrations is the only remaining contaminated media that constitutes the Groundwater VOCs Source Area. This area is bounded to the east by SB33, to the west by W36C, to the south by SB36A, and to the north by SB32, which is a 100ft by 120ft area.);

- On-Property Groundwater Plume (i.e., below the Beloit Corporation Property); and,
- Off-Property Groundwater Plumes (i.e., below the residential area to the east and the village to the south of the NPL site).

The potential sources and/or origination of the COPCs (as identified in the BlRA) in these media is discussed further in the summary of the remedial investigation Section 3.1 of this report. Therefore, the following discussion and screening of technologies is based upon the identified COPCs in each media. Additionally, each of these media of concern will be addressed in the development of the remedial action objectives and alternatives to meet these objectives, which follow in subsequent sections. In addition, the following media are not considered media of concern and will not be addressed further in this FS.

- Surface Water
- Sediment
- Surface Soils including Foundry Sand Soils
- Subsurface Soils
- Air

4.2 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals for protecting human health and the environment for each of the media of concern. Several specific remedial action objectives were developed while considering the long-term goals of protecting human health and the environment, reducing exposure to the detected COPCs, and achieving compliance where possible with the Applicable or Relevant and Appropriate Requirements (ARARs). An example ARAR for this project are groundwater quality standards.

Groundwater at the site is considered Class I Groundwater, according to Title 35 IAC Section 620. Standards applicable to this groundwater are also found Title 35 IAC Section 620.

4.2.1 Groundwater VOCs Source Area

The remedial action objectives for the Groundwater VOCs Source Area are as follows:

- To control the source of COPCs in groundwater to the extent practicable.

- Under current land use conditions and future hypothetical land use conditions, prevent the use of the groundwater from the source area containing COPCs for domestic uses (i.e., drinking and bathing water).

- Remediate the Groundwater VOC Source Area to achieve compliance with the applicable Groundwater Quality Standards (IAC Part 620), including 620.410 Class I Groundwater Quality Standards for Class I Potable Resource Groundwater, or 620.450 Alternative Groundwater Quality Standards.

4.2.2 On-Property Groundwater Plume

The remedial action objectives for the On-Property Groundwater Plume are as follows:

- Under current land use conditions and future hypothetical land use conditions, prevent the use of the On-Property Groundwater Plume containing COPCs for drinking water or other associated residential purposes.

- Manage or treat the On-Property Groundwater Plume to reduce the affect of the groundwater COPCs to properties located outside the Beloit Corporation property boundaries to the extent practicable.

- Remediate the On-Property Groundwater Plume containing COPCs to achieve compliance with the applicable standards in Illinois Administrative Code (IAC) Part 620, including 620.410 Groundwater Quality Standards for Class I Potable Resource Groundwater, or 620.450 Alternative Groundwater Quality Standards.

4.2.3 Off-Property Groundwater Plumes

The remedial action objectives for the groundwater containing COPCs outside the Beloit Corporation property boundaries are as follows:

- Under current land use conditions and future hypothetical land use conditions, prevent potential exposure to COPCs released from the Beloit Corporation Groundwater VOC Source area, by general use of groundwater, above health protective levels (see 2nd and 3rd bullets below). Potential receptors under current land use conditions and future hypothetical land use conditions are considered to be residents of these areas (adults and children).

- Remediate the groundwater to applicable groundwater quality standards.

- Reduce the potential noncarcinogenic effects attributable to the general use of groundwater containing COPCs as measured by the hazard index (HI), to HI values of less than 1.

It is important to note that remedial actions for the on-property groundwater plumes may also potentially aid in the remediation of the Off-Property Groundwater Plumes, either through the control of the migration of this plume to off-property wells, or through the direct remediation of these plumes via carryover from actions taken on the Beloit Corporation property.

IAC Part 620 contains the groundwater standards used as the ARARs for this site. IAC Part 620.410 Groundwater Quality Standards for Class I Potable Resource Groundwater includes the standards for Class I groundwater at the site. IAC Part 620.450 Alternative Groundwater Quality Standards is an important reference for this site and may be applied to this medium and considered at each of the 5 year reviews. Also, at each five year period, the effectiveness of the remedial actions will be assessed, appropriate modifications made, and it will be determined whether Alternative Groundwater Quality Standards under IAC Part 620.450 are appropriate for the site.

4.3 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

General response actions describe broad types of actions which could be conducted to satisfy the remedial action objectives. Potential general response actions are gathered from U.S. EPA guidance documents, literature review, and experience at other sites.

The six general response actions for the three identified groundwater media are listed below and shown schematically in Table 4-1.

- No Action
- Institutional Controls
- Monitoring
- Gradient Controls
- Extraction and Ex-situ Treatment
- In-situ Treatment

4.4 VOLUMES OR AREAS OF THE MEDIA OF CONCERN

The purpose of this task is to make an initial determination of the volume or area for each of the media of concern to which general response actions might be applied. The areas and volume of groundwater containing COPCs is computed for the source area (i.e., the area of highest concentration nearest the point of release), the On-Property Groundwater Plume, and the Off-Property Groundwater Plumes.

The distribution of total chlorinated VOCs present in groundwater on the Beloit Corporation property, south of the property, and within Blackhawk Acres subdivision is shown on Drawing A2 for November 1995-July 1996, Drawing A3 for April 1998, and on Drawing A4 for January 2001. These maps do not discriminate between the presence of PCE, TCE, and other chlorinated VOCs, or the source(s) of these VOCs.

4.4.1 Groundwater VOC Source Area

Due to soil and groundwater concentrations of PCE in monitoring wells W23/W23B and W36C, the southern area of the current erection bay is believed to be the source area for the On-Property Groundwater Plume. Due to the very low VOC concentrations of PCE and small volume of affected soil, the mass of VOCs present in the unsaturated zone soils does not present a significant source of VOCs to the underlying groundwater that requires remediation.

The area of CVOCs in excess of 1,000 μg/L in groundwater based on lab and field screening results is estimated to be approximately 100 feet by 120 feet (12,000 $ft.^2$). It is conservatively estimated that the plume in this area extends to approximately 60 ft below ground surface (bgs), for a saturated thickness of about 40 ft (i.e., the high water level is about 20 ft bgs). Using a porosity value of 0.3, the resulting volume of groundwater in this area (i.e., the groundwater within the 1,000 μg/L contour) is approximately 1.07 million gallons.

4.4.2 VOCs in On-Property Groundwater Plume

The On-Property Groundwater Plume is the groundwater on the Beloit Corporation property within the non-detect (ND) total CVOC concentration contour as defined on Drawing A3. This PCE plume is located on the southern portion of the Beloit Corporation property. The area within the non-detect total CVOC concentrations contour is approximately 40 acres. The Beloit Corporation property outside of the plume is approximately 170 acres. It is important to note that this area includes the source area, described above. It is conservatively estimated that this plume has an average depth of 70 ft bgs with a total saturated thickness of 50 ft (i.e., the high water level is about 20 ft bgs). Using a porosity value of 0.3 for this plume, the resulting volume of this groundwater is approximately 196 million gallons.

4.4.3 VOCs in Off-Property Groundwater Plumes

The area of the Off-Property Groundwater Plumes within the ND total CVOC concentration contour as defined on Drawing A3, is conservatively assumed to extend to the River. This is a conservative assumption, because the southern portion of these plumes is only delineated by monitoring results from the four wells (W43C, W47C, W48C, and W49C) within the Village of Rockton. This area is approximately 156 acres. These plumes are estimated to have an average depth of 85 ft bgs, with a total saturated thickness of 65 ft (i.e., the high water level is about 20 ft bgs). Using a porosity value of 0.3 for these plumes, the resulting volume of the Off-Property Groundwater Plumes is approximately 991 million gallons.

4.5 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

The purpose of this task is to identify and screen a broad range of remedial technologies and process options. Remedial technologies are general categories of technologies or steps that may be taken in the management/remediation of a site. Process options are specific technologies or processes within each technology type.

The remedial technologies and process options are screened at this point based on their technical implementability. Remedial technologies and process options that are applicable are carried forward for further evaluation. Those not technically implementable are dropped. This process is shown schematically on Table 4-1. As shown on Table 4-1, several remedial technologies may be identified for each general response action, and numerous process options may exist within each technology type. Table 4-1 also provides a description of each process option and includes the reason for carrying forward or dropping individual process options for each media of concern.

4.5.1 Groundwater VOC Source Area

The identified groundwater remediation approaches applicable to the Groundwater VOC Source Area for PCE at the erection bay are shown in Table 4-1. Eleven separate remedial technology types, under the six general response actions listed in Section 4.3, were identified. These remedial technology types are listed below:

- No Action
- Deed Restrictions
- Monitoring
- Containment
- Groundwater Recharge Elimination
- Biological Treatment of Extracted Groundwater
- Chemical Treatment of Extracted Groundwater
- Physical Treatment of Extracted Groundwater
- Biological Treatment of Groundwater In-Situ
- Chemical Treatment of Groundwater In-Situ

- Physical Treatment of Groundwater In-Situ

Numerous different process options were then identified for each of these technology types. All of the identified technology types are technically implementable in a general sense to effectively remediate, reduce the human health risk, or manage the Groundwater VOC Source Area containing COPCs. Therefore, none of the remedial technology types were eliminated as part of this screening step. However, some of the identified process options were eliminated through this step. The eliminated process options were generally those that are not known to be applicable to manage the COPCs in this groundwater. For the Groundwater VOC Source Area, the process options eliminated due to non-viability are listed below with the reasons for their elimination.

- Impermeable Surface Cap. This option is not viable because it would not reduce groundwater influx from areas beyond the limits of the impermeable cap. The option's effectiveness is also limited to VOCs present in the unsaturated zone.

- Aerobic treatment of Extracted Groundwater. This option is not viable because the detected COPCs are not known to be effectively aerobically biodegraded.

- Chemical Precipitation of Extracted Groundwater. This option is not viable because the detected COPCs are not effectively precipitated.

- Ion Exchange of Extracted Groundwater. This option is not viable because the detected COPCs are neutral compounds.

- Electrokinetic Treatment of Groundwater, In-situ. This option is not viable because this technology is only designed for very low hydraulic conductivity systems.

All of the other process options were carried forward to the evaluation and selection of the process options step, which is described in Section 4.6.

4.5.2 On-Property Groundwater Plume

The identified groundwater remediation approaches applicable to the On-Property Groundwater Plume are shown in Table 4-1. Eleven separate remedial technology types, under the six general response actions listed in Section 4.3, were identified. These remedial technology types are listed below:

- No Action

- Deed Restrictions

- Monitoring

- Containment

- Groundwater Recharge Elimination
- Biological Treatment of Extracted Groundwater
- Chemical Treatment of Extracted Groundwater
- Physical Treatment of Extracted Groundwater
- Biological Treatment of Groundwater, In-situ
- Chemical Treatment of Groundwater, In-situ
- Physical Treatment of Groundwater, In-situ

Numerous different process options were then identified for each of these technology types. All of the identified technology types are technically implementable in a general sense to effectively remediate, reduce the human health risk, or manage the On-Property Groundwater Plume containing COPCs. Therefore, none of the remedial technology types were eliminated as part of this screening step. However, some of the identified process options were eliminated through this step. The eliminated process options were generally those that are not known to be applicable to manage the COPCs in this groundwater. For the On-Property Groundwater Plume, the process options eliminated due to non-viability are listed below with the reasons for their elimination.

- Impermeable Surface Cap. This option is not viable because it would not reduce groundwater influx from areas beyond the limits of the impermeable cap. The option's effectiveness is also limited to VOCs present in the unsaturated zone.
- Aerobic treatment of Extracted Groundwater. This option is not viable because the detected COPCs are not known to be effectively aerobically biodegraded.
- Chemical Precipitation of Extracted Groundwater. This option is not viable because the detected COPCs are not effectively precipitated.
- Ion Exchange of Extracted Groundwater. This option is not viable because the detected COPCs are neutral compounds.
- Electrokinetic Treatment of Groundwater, In-situ. This option is not viable because this technology is only designed for very low hydraulic conductivity systems.

All of the other process options were carried forward to the evaluation and selection of the process options step, which is described in Section 4.6.

4.5.3 Off-Property Groundwater Plumes

The identified groundwater remediation approaches applicable to the Off-Property Groundwater Plumes are shown in Table 4-1. Twelve separate remedial technology types, under the six general response actions listed above, were identified and screened according to their applicability to these groundwater plumes. These remedial technology types are listed below:

- No Action
- Deed Restrictions
- Water Supply Transfer
- Monitoring
- Containment
- Groundwater Recharge Elimination
- Biological Treatment of Extracted Groundwater
- Chemical Treatment of Extracted Groundwater
- Physical Treatment of Extracted Groundwater
- Biological Treatment of Groundwater, In-situ
- Chemical Treatment of Groundwater, In-situ
- Physical Treatment of Groundwater, In-situ

Numerous different process options were then identified for each of these technology types. All of the identified remedial technology types are technically implementable in a general sense to effectively remediate, prevent the exposure to, or reduce the human health risk posed by the Off-Property Groundwater Plumes. Therefore, none of the remedial technology types were eliminated as part of this screening step. However, some of the identified process options were eliminated through this step. The eliminated process options were generally those that are not known to be technically implementable to manage the detected COPCs. For the Off-Property Groundwater Plumes, the process options eliminated due to technical implementability limitations are listed below with the reasons for their elimination.

- Impermeable Surface Cap. This option is not viable because it would not reduce groundwater influx from areas beyond the limits of the impermeable cap. The option's effectiveness is also limited to VOCs present in the unsaturated zone.

- Aerobic Treatment of Extracted Groundwater. This option is not viable because the detected COPCs are not known to be effectively aerobically biodegraded.

- Chemical Precipitation of Extracted Groundwater. This option is not viable because the detected COPCs are neutral, and thus are not effectively precipitated.

- Ion Exchange of Extracted Groundwater. This option is not viable because the detected COPCs are neutral compounds.

- Electrokinetic Treatment of Groundwater, In-situ. This option is not viable because this technology is only designed for very low hydraulic conductivity systems.

All of the other process options were carried forward to the evaluation and selection of process options step, which is described in the following section.

4.6 EVALUATION AND SELECTION OF PROCESS OPTIONS

The last task prior to developing the specific remedial action alternatives is to evaluate the remaining specific remedial process technologies in greater detail, and to assist in selecting the process options to represent the various technology types. The purpose of this task is to select a limited number of promising process options for consideration in developing remedial action alternatives. Process options are evaluated considering:

- Effectiveness

- Implementability

- Cost

Effectiveness is the primary criterion used to screen process options at this point in the process. Process options are evaluated based on their effectiveness relative to the other process options within the same technology type. Effectiveness focuses on: (1) the potential effectiveness of process options in handling the estimated areas or volumes of media and meeting the remediation goals identified in the remedial action objectives; (2) the potential impacts to human health and the environment during the construction and implementation phase; and (3) how proven and reliable the process is with respect to the contaminants and conditions at the site. Effectiveness is evaluated considering potential end results. For example, the ability of the technology to meet the remedial action objective and the ability of the technology to adequately accommodate the relevant waste type and quantities is critical for a technology to be retained.

Implementability focuses on the technical feasibility and availability of the technologies each process option would employ, and the administrative feasibility of implementing the process option. Technical implementability considers a range of factors relevant to obtaining, installing, and using a particular technology. Technology types and process options that are ineffective or unworkable at the site are eliminated. Some remedial technologies are proven and readily available, while others are in the research and development stages. Insufficiently developed technologies are generally screened out. Site conditions must be compatible with the feasible range of a given technology's capabilities, considering for example, depth to bedrock, depth to groundwater, space requirements, ability of the technology to treat the COPCs identified, etc. Administrative implementability considers a range of factors relevant to the testing, review, approval, or permitting of a particular technology.

Cost is evaluated relative to construction (capital) costs and any long-term (operation and maintenance) costs required to operate and maintain the process option. Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are grossly expensive but also equally or only marginally more effective than much lower cost technologies are deleted.

The process options are evaluated at this point based on their effectiveness, implementability, and relative cost for this site. This evaluation is documented on Table 4-2. Table 4-2 includes the evaluation of each process option retained from Table 4-1 for the above three criteria.

4.6.1 Groundwater VOC Source Area

Process options relating to the Groundwater VOC Source Area which were evaluated and not carried forward are shown on Table 4-2 and consist of the following:

- Natural Attenuation Monitoring: This option was not carried forward because the existing natural attenuation occurring at the site is inadequate to achieve remedial action objectives. However, advection, dilution, and dispersion processes of natural attenuation are occurring and can be monitored through routine groundwater monitoring. In addition, this process would not protect against possible exposure to VOCs in groundwater.

- Slurry Wall: This option was not carried forward because it does not actively remediate the groundwater and has a high capital construction cost due to the depth to a confining layer (70 ft bgs). Currently the groundwater source lies underneath the building footprint. This would add to construction costs since the slurry wall would have to encompass the building footprint which is approximately 3,000 lf.

- Passive Wall Treatment: This option was not carried forward because it does not actively remediate the groundwater and has a high capital construction cost due to the depth to a confining (clay) layer (70 ft bgs). Additionally, passive wall treatment would require a long remediation time frame. This treatment option would require special equipment (for wall installation) which would add to the construction costs.

- Thermal Vapor Extraction: This option was not carried forward because of the difficulty to implement the heating and vapor wells and the long duration needed for the remedial activity. In addition, the option has both high capital and long-term O&M costs.

The following treatment mechanisms for extracted groundwater were not carried forward because the existing air stripper on-site is proven effective and has no additional capital costs and a low operating cost.

- Cometabolic Aerobic Biodegradation
- Anaerobic Biodegradation
- Spray Evaporation
- Carbon Adsorption
- Discharge to POTW of Extracted Groundwater
- Reverse Osmosis

The process options evaluated and retained for the Groundwater VOC Source Area include:

- No Action. This option was retained because it is required to be evaluated through the detailed analysis of alternatives by the NCP. It is important to note that currently an Interim Source Control Action (ISCA) is in place on-site as well as point-of-entry treatments systems for private wells with VOC concentrations meeting or exceeding applicable MCLs. Under the No Action alternatives these affected systems would be discontinued.
- Groundwater Use Restrictions
- Groundwater Monitoring
- Groundwater Extraction for Containment
- Air Stripping of Extracted Groundwater
- Enhanced Biodegradation
- Air Sparging/Soil Vapor Extraction
- Vacuum Vapor Extraction

- In-situ Chemical Oxidation

These remaining process options were carried forward and are evaluated in the development of remedial action alternatives for the Groundwater VOC Source Area, which is discussed in further detail in Section 5.

4.6.2 On-Property Groundwater Plume

Process options relating to the On-Property Groundwater Plume which were evaluated and not carried forward are shown on Table 4-2 and consist of the following:

- Natural Attenuation Monitoring: This option was not carried forward because there is no indication of significant biodegradation occurring. However, advection, dilution, and dispersion processes of natural attenuation are occurring and can be monitored through routine groundwater monitoring. In addition, this alternative would not protect against possible exposure to contaminated groundwater containing COPCs.

- Slurry Wall: This option was not carried forward due to the fact that this option does not actively remediate the groundwater. It would have very high capital and construction costs to encompass the entire on-property groundwater plume.

- Cometabolic Aerobic Biodegradation of Extracted Groundwater: This option was not carried forward because it is not technically proven, it would require significant bench-scale testing prior to implementation, it would likely require a long remediation period to treat the On-Property Groundwater Plume, and it may not be able to meet discharge standards. Furthermore, this option would require the construction of a specialized treatment train and due to the long remediation period, operations and maintenance (O&M) costs would likely be high.

- Anaerobic Biodegradation of Extracted Groundwater: This option was not carried forward because it is not technically proven, it would require significant bench-scale testing prior to implementation, it would likely require a long remediation period to treat the On-Property Groundwater Plume, and it may not be able to meet the required discharge standards. Furthermore, this option would require the construction of a specialized treatment train and due to the long remediation period, O&M costs would be high.

- Spray Evaporation of Extracted Groundwater: This option was not carried forward because it has numerous potential health side effects, it would require significant energy input to completely evaporate the extracted water, and it would likely require a long remediation period to treat all of the COPCs in the On-Property Groundwater Plume. Furthermore, this option would require the construction of a specialized treatment train and due to the long remediation period, O&M costs would be high.

In order to insure that the extracted groundwater is evaporated, significant heating may be required, driving up the O&M costs considerably.

- Carbon Adsorption of Extracted Groundwater: This option was eliminated because it would be expected that large amounts of activated carbon would be required throughout the expected remediation period.

- Discharge Groundwater to Publicly Owned Treatment Works (POTW): This option was eliminated because it may have side health effects from vaporized VOCs within the local sewer system, it may require the expansion of the POTW to handle the additional flow, the POTW may not accept the flow, and treatment fees posed by the POTW may be significant.

- Reverse Osmosis Treatment of the Extracted Groundwater: This option was eliminated because it would require the construction of a complex treatment system, it is not more effective for the treatment of the COPCs in this groundwater plume compared to other physical treatment technologies, and it would have high capital and O&M costs.

- Passive Groundwater Treatment Through a Permeable Barrier Wall: This option was eliminated because it would require the installation of a long and deep wall to fully encompass the path of the On-Property Groundwater Plume. The option would also have high capital costs and long-term O&M costs.

- Vacuum Vapor Extraction, In-situ: This option was eliminated because it would require the installation of special wells and submersible equipment, the technology has not been completely proven, and moderate to high capital costs and long-term O&M costs would be expected.

- Enhanced Anaerobic Treatment of Groundwater In-situ: This option was not brought forward due to the cost of implementing and maintaining this system for the entire 40-acre plume.

- Chemical Oxidation of Groundwater: This option was not carried forward because of the cost of implementing and maintaining an effective system for the entire 40 acre plume.

- Air Sparing/Soil Vapor Extraction: This option was not brought forward because of the cost of implementing and maintaining an effective system for the entire 40-acre plume.

- Thermal Vapor Extraction of Groundwater, In-situ: This option was eliminated because it would require the installation of special heating and extraction wells, and high capital costs and long-term O&M costs would be expected.

The process options evaluated and retained for the On-Property Groundwater Plume include:

- No action. This option was retained because it is required to be evaluated through the detailed analysis of alternatives by the NCP. It is important to note that the ISCA system is on-site, and private wells with VOC concentrations meeting or exceeding applicable MCLs are on point-of-entry treatment systems. Under the no-action alternative these systems would be discontinued.

- Groundwater use restrictions

- Groundwater monitoring

- Groundwater extraction for containment

- Chemical oxidation treatment of extracted groundwater

- Air stripping of extracted groundwater

These remaining process options were carried forward and are evaluated in the development of remedial action alternatives for the On-Property Groundwater Plume, which is discussed in further detail in Section 5.

4.6.3 Off-Property Groundwater Plumes

Process options relating to the Off-Property Groundwater Plumes, which were evaluated and not carried forward are shown on Table 4-2 and consist of the following:

- Slurry Wall: This option was not carried forward due to the fact that this option does not prevent the exposure to the COPCs in these groundwater plumes through the private wells, it would require special equipment to install, groundwater flow may short-circuit it following installation, and it would have very high capital and construction costs.

- Natural Attenuation Monitoring: This option was not carried forward because there is no indication of significant biodegradation occurring. However, advection, dilution, and dispersion processes of natural attenuation are occurring and can be monitored through routine groundwater monitoring. In addition, this alternative would not protect against possible exposure to contaminated groundwater containing COPCs.

- Cometabolic Aerobic Biodegradation of Extracted Groundwater: This option was not carried forward because it is not technically proven, it would require significant bench-scale testing prior to implementation, it would require a large remediation system, it would likely require a long remediation period to treat the Off-Property Groundwater Plumes, and it may not be able to meet the discharge standards.

Furthermore, this option would require the construction of a specialized treatment train and due to the long remediation period, O&M costs would be significant.

- Anaerobic Biodegradation of Extracted Groundwater: This option was not carried forward because it is not technically proven, it would require significant bench-scale testing prior to implementation, it would require the construction of a large extraction system, it would likely require a long remediation period to treat the Off-Property Groundwater Plumes, and it may not be able to meet the required discharge standards. Furthermore, this option would require the construction of a specialized treatment train and due to the long remediation period, O&M costs would be significant.

- Chemical Oxidation of Extracted Groundwater: This option was not carried forward because it would not prevent exposure to the COPCs in the groundwater through private wells, and it would require the construction of a large scale and intrusive groundwater extraction and treatment system. Construction and O&M costs would also likely be significant.

- Spray Evaporation of Extracted Groundwater: This option was not carried forward because it may have numerous potential side health effects, the extracted water may require a significant energy input to completely evaporate the extracted water, and it would likely require a long remediation period to treat the Off-Property Groundwater Plumes. This technique would require the construction of a large extraction system through numerous private and public properties. Furthermore, this option would also require the construction of a specialized treatment train and due to the long remediation period, O&M costs would be high. In order to insure that the extracted groundwater is evaporated, significant heating may be required, driving up the O&M costs considerably.

- Discharge of Groundwater to the POTW: This option was eliminated because it may have side health effects from volatilized COPCs within the local sewer system, it may require the expansion of the POTW to handle the additional flow, the POTW may not accept the flow, and treatment fees posed by the POTW may be significant. The option would also require the construction of a large-scale groundwater extraction system and connections to existing sewer lines on both private and public properties.

- Reverse Osmosis Treatment of the Extracted Groundwater: This option was eliminated because it would require the construction of a complex treatment system, and it would have high capital and O&M costs. The option would also require the construction of a large-scale and intrusive groundwater extraction system on both private and public properties.

- <u>In-situ Enhanced Biodegradation</u>: This option was eliminated because it does not prevent the exposure to the COPCs contained within this groundwater through private wells, it would require the installation of numerous, intrusive chemical injection wells, and the costs for the large amounts of chemical required would be significant.

- <u>In-situ Chemical Oxidation</u>: This option was eliminated because it does not prevent the exposure to the COPCs contained within this groundwater through private wells, it would require the installation of numerous, intrusive chemical injection wells, and the costs for the large amounts of chemical required would be significant.

- <u>Passive Groundwater Treatment Through a Permeable Barrier Wall</u>: This option was eliminated because it would require the installation of a long and deep wall to cutoff the path of the Off-Property Groundwater Plumes. The option would also have high capital costs and long-term O&M costs.

- <u>Air Sparging/Soil Vapor Extraction</u>: This option was eliminated because it would require the installation of a large-scale air injection and extraction system, it would not prevent the exposure to COPCs in the groundwater through the residential wells, and costs would be expected to be high for the construction and operation of such a large system.

- <u>Vacuum Vapor Extraction of Groundwater, In-situ</u>: This option was eliminated because it would require the installation of special wells and submersible equipment, the technology has not been completely proven, and moderate to high capital costs and long-term O&M costs would be expected. Again, the option would also require the installation of numerous, intrusive extraction wells.

- <u>Thermal Vapor Extraction of Groundwater, In-situ</u>: This option was eliminated since it would require the installation of special heating and extraction wells, and high capital costs and long-term O&M costs would be expected. Again, the option would also require the installation of numerous, intrusive extraction wells.

The process options evaluated and retained for the Off-Property Groundwater Plumes include:

- No action. This option was retained because it is required to be retained through to the detailed analysis of alternatives by the NCP. It is important to note that the ISCA system is on-site, and private wells with VOC concentrations meeting or exceeding applicable MCLs are on point-of-entry treatment systems. Under the no-action alternative these systems would be discontinued.

- Groundwater management zone (GMZ) establishment. A three dimensional GMZ area can be defined to impacted groundwater for the implementation of alternative groundwater remediation levels, according to IAC 620.250.

- Connection of private residences/wells to the municipal water supply system.

- Redrilling of private wells. It is important to note though that this option may not be applicable for some private wells due to their proximity to the municipal water supply system and local regulations. Usage of this exposure control option will be made on an individual basis.

- Groundwater monitoring.

- Extraction and air stripping of groundwater.

- Carbon adsorption of extracted groundwater (through point-of-entry treatment systems).

These remaining process options were carried forward and are evaluated in the development of remedial action alternatives for the Off-Property Groundwater Plumes, which is discussed in further detail in Section 5.

N:\Jobs\208\2402\01\wp\rpt\99_FS Sec 4 revised 2.doc

5.0 DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES

This section discusses the development and screening of remedial action alternatives. The objective of developing alternatives is to assemble the remaining remedial technologies carried through the initial screening into remedial action alternatives that protect human health and the environment, and encompass a range of potentially appropriate remedial options. These alternatives should also meet the identified remedial action objectives.

The objective of subsequent alternative screening is to narrow the list of potential alternatives developed that will be evaluated in the detailed analysis section. This subsequent screening aids in streamlining the FS process while retaining the most promising alternatives for more detailed consideration. In this case, due to the limited number of action alternatives developed (six remedial action alternatives and one no action alternative) it was felt that the screening effort was unnecessary. This is consistent with the recommendations contained in the U.S. EPA CERCLA RI/FS guidance manual (U.S. EPA, 1988), which in part states, "... in those instances in which circumstances limit the number of available options, and therefore the number of alternatives that are developed, it may not be necessary to screen alternatives prior to the detailed analysis."

5.1 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

Due to the nature and extent of the COPCs contained within the groundwater both on and off the Beloit Corporation property, the remedial alternatives developed may include portions or all of the process options that remained following the screening of process options, which is described in the previous section. These remedial alternatives were assembled to meet the remedial action objectives discussed in Section 4.2, for the media of concern; the groundwater VOC source area, and the on-and off-property groundwater plumes (as defined in Section 3.1). To simplify the detailed analysis each alternative includes remedial actions for all three areas since groundwater is the media of concern in each area. The no action alternative, required by the NCP, is included to provide an assessment of the consequences of taking no remedial response actions.

The approach to the management and/or remediation of the three media of concern is quite different, despite the fact that all are impacted by CVOCs (PCE primarily in the Groundwater VOC Source Area and the On-Property Groundwater Plume, and TCE primarily in the Off-Property Groundwater Plumes). Due to the size, potential property access restrictions, plume migration ability, and relatively low COPC concentrations within the Off-Property Groundwater Plumes, some forms of active source treatment options were not considered feasible. Whereas, the On-Property Groundwater Plume can potentially be managed and/or remediated in a much different manner, due to its smaller size, ease of property access, and presence of a known source area.

Table 5-1 illustrates how the remaining process options may be combined and developed in these remedial action alternatives.

5.2 SUMMARY OF DEVELOPED REMEDIAL ACTION ALTERNATIVES

The remedial alternatives assembled for mitigating the environmental and human health risks associated with the Groundwater VOC Source Area and the On and Off-Property Groundwater Plume(s) are summarized below.

- Alternative 1 – No Action (required by NCP).
- Alternative 2 – On-Property Groundwater Pump and Treat, and Off-Property Groundwater Plumes Exposure Control.
- Alternative 2a – On-Property Groundwater Pump and Treat, and Off-Property Groundwater Pump and Treat.
- Alternative 3 – Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control.
- Alternative 3a – Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat.
- Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control.
- Alternative 4a – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat.

A detailed description of each of these alternatives is provided in Section 6.0. These alternatives were assembled and included due to their ability to satisfy the remedial action objectives as given in Section 4.2. The no action alternative was included since it is a requirement of the NCP. It is important to note that under current conditions, the ISCA is containing the COPCs in the groundwater below the site, and private wells with VOC concentrations equal to or exceeding applicable MCLs are on point-of-entry treatment systems. Under the no action alternative these systems would be discontinued.

6.0 DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of remedial action alternatives compiled in Section 5 from the process options, which were retained through the screening of technologies in Section 4.

The detailed analysis of alternatives presents information necessary for the selection of a remedy. During the detailed analysis, each alternative is assessed against nine evaluation criteria. Only the first seven evaluation criteria are evaluated in this FS. The remaining two evaluation criteria, State Acceptance and Community Acceptance will be discussed in the Record of Decision (ROD) after receiving comments on the RI/FS reports and the Proposed Plan from the state and community. This approach, outlined in the U.S. EPA manual "Guidance for Conduction Remedial Investigations and Feasibility Studies Under CERCLA" (1988), is designed to provide sufficient information to adequately compare the alternatives, select an appropriate remedy, and demonstrate compliance with the statutory requirements.

To aid in this analysis, certain assumptions were made for each alternative regarding system design. These assumptions are presented in the description of each alternative prior to alternative analysis. These assumptions are provided to aid in the analysis of alternatives, and are not intended for use as a conceptual or preliminary design. Where appropriate, these assumptions are uniformly applied to each alternative.

6.1 EVALUATION CRITERIA

Nine evaluation criteria have been developed to address the CERCLA requirements and considerations listed above, as well as additional technical and policy considerations that have proven to be important for selection of remedial alternatives. The nine evaluation criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume Through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost

8. State Acceptance

9. Community Acceptance

These evaluation criteria serve as the basis for conducting the detailed analysis during the FS, and for subsequently selecting an appropriate remedial action. These criteria are categorized into three groups:

- *Threshold Criteria* – includes overall protection of human health and the environment; and compliance with ARARs.

- *Primary Balancing Criteria* – includes long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.

- *Modifying Criteria* – includes state and community acceptance.

The specific CERCLA requirements that must be addressed in the FS report for each remedial action are that each action should:

- Be protective of human health and the environment.

- Be compliant with ARARs (or provide grounds for invoking an ARAR waiver).

- Be cost-effective.

- Use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element (or provide and explanation as to why it does not).

In addition, CERCLA places an emphasis on evaluating long-term effectiveness and related considerations for each of the alternative remedial actions. These statutory considerations include:

- The long-term uncertainties associated with land disposal.

- The goals, objectives, and requirements of the Solid Waste Disposal Act.

- The persistence, toxicity, and mobility of hazardous substances and their constituents, and their propensity to bioaccumulate.

- Short-term and long-term potential for adverse health effects from human exposure.

- Long-term maintenance costs.

- The potential for future remedial action costs if the alternative remedial action in question was to fail.

- The potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment.

6.1.1 Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether an alternative provides adequate protection of human health and the environment from the short-term risks posed by hazardous substances, pollutants, or contaminants present at the site. This protection can be accomplished by eliminating, reducing, or controlling exposures to contaminants at levels established during the development of remedial action objectives. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

6.1.2 Compliance with ARARs

This evaluation criterion assesses whether an alternative can comply with federal and state ARARs. ARARs are discussed in terms of chemical-specific, location-specific, and action-specific. An alternative that does not comply with an ARAR may have grounds for invoking a waiver as described in the NCP under paragraph 40 CFR 300.430(f)(1)(ii)(C). An ARAR waiver may be invoked under the following circumstances:

- The alternative is an interim measure and will become part of a total remedial action that will attain the ARAR.

- Compliance with the ARAR will result in greater risk to human health and the environment.

- Compliance with the ARAR is technically impracticable.

- The alternative will attain a standard of performance that is equivalent to that required by the ARAR through use of another method.

- A state ARAR has not been consistently applied in similar circumstances within the state.

If an ARAR waiver is appropriate, the reasons for invoking the waiver will be presented in the ARAR discussion of the particular alternative.

Chemical-specific ARARs are numerical standards that establish the acceptable amount or concentration of a chemical that may be found in, or discharged to the environment.

Chemical-specific ARARs may be derived from several standards including Resource Conservation and Recovery Act (RCRA) Maximum Concentration Limits (MCLs) in groundwater, Safe Drinking Water Act (SDWA) MCLs, and Water Quality Criteria.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations, such as floodplains, wetlands, historic places, or sensitive ecosystems or habitats. Location-specific ARARs may be derived from several standards including RCRA location requirements, National Historic Preservation Act of 1966 (NHPA), Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, Wild and Scenic Rivers Act, Coastal Zone Management Act, and the Clean Water Act.

Action-specific ARARs are technology-based or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy.

The following definitions of "applicable" and "relevant and appropriate" are presented for reference:

> *Applicable Requirements* – means those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. "Applicability" implies that the remedial action of the circumstances at the site satisfy all of the jurisdictional prerequisites of a requirement. If a requirement is not applicable, it must be determined whether it is both relevant and appropriate.
>
> *Relevant and Appropriate Requirements* – means those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that address problems or situations sufficiently similar to those encountered at the CERCLA site. While these requirements are not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, their use is well suited to the particular site. However, in some circumstances, a requirement may be relevant but not appropriate for the site-specific situation.

In determining whether a requirement is relevant and appropriate, a comparison is made to the pertinence of several factors such as:

- The purpose of the requirement and the purpose to the CERCLA action.
- The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site.

- The substances regulated by the requirement and the substances found at the CERCLA site.

- The actions or activities regulated by the requirement and the remedial action contemplated at the CERLCA site.

- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site.

- The type of place regulated and the type of place affected by the release or CERCLA action.

- The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action.

- Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

The pertinence of each of the factors depends, in part, on whether a requirement addresses a chemical, location, or action.

The lead and support agencies may identify other appropriate advisories, criteria, or guidance to be considered for a particular release, in addition to applicable or relevant and appropriated requirements. The "to be considered" (TBC) category consists of advisories, criteria, or guidance that were developed by the U.S. EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

Table 6-1 lists potential federal and state ARARs for the alternatives presented in this report. The ARARs listed in Table 6-1 were compiled by Montgomery Watson.

6.1.3 Long-Term Effectiveness and Permanence

This evaluation criterion assesses the long-term effectiveness and permanence an alternative affords, along with the degree of certainty that the alternative will prove successful. Specifically, this criterion evaluates the long-term effectiveness in maintaining protection of human health and the environment after the remedial action objectives are met. Factors that are considered as appropriate include the following:

- Magnitude of residual risk remaining from untreated waste, or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

- Adequacy and reliability of controls, such as containment systems and institutional controls, that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals, and assessment of the potential need to replace technical components of the alternative, and the potential need to replace technical components of the alternative, and the potential exposure pathways and the risks posed should the remedial action need replacement.

6.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This evaluation criterion assesses the degree to which an alternative employs recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site. In addition, this criterion evaluates the anticipated performance of the specific treatment technologies in each alternative. Factors that are considered appropriate include the following:

- Treatment or recycling processes the alternative employs and the materials that are treated.
- Amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled.
- Degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling, and the specifications of which reduction(s) are occurring.
- Degree to which the treatment is irreversible.
- Type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents.
- Degree to which treatment reduces the inherent hazards posed by the principal threats at the site.

6.1.5 Short-Term Effectiveness

This evaluation criterion evaluates the effectiveness of alternatives in maintaining protection of human health and the environment until the remedial action objectives are met. Specifically, this evaluation criterion assesses the short-term impacts of alternatives including the following:

- Short-term risks that might be posed to the community during implementation of an alternative.
- Potential impacts on workers during remedial action, and the effectiveness and reliability of protective measures.

- Potential environmental impacts of the remedial action, and the effectiveness and reliability of mitigated measures during implementation.

- Time until remedial action objectives are achieved.

6.1.6 Implementability

This evaluation criterion assesses the ease or difficulty of implementing the alternative by considering the following types of factors, as appropriate:

- *Technically Feasibility* – includes technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.

- *Administrative Feasibility* – includes activities needed to coordinate with other offices and agencies, and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions).

- *Availability of Necessary Services and Materials* – includes the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions necessary to provide additional resources; and availability of prospective technologies.

6.1.7 Cost

This evaluation criterion assesses various types of costs, including:

- Capitol costs.

- Annual operation and maintenance (O&M) costs.

- Net present value of capital and O&M costs.

Cost figures obtained from readily available sources (e.g., Means Site Work Cost Data, costs for other similar projects, and local suppliers) are used to estimate costs for each of the alternatives for comparison purposes. These cost estimates should not be considered the actual cost of designing and implementing a remedial action, but rather relative costs among the alternatives using consistent assumptions and estimating methods. According to the U.S. EPA manual "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (July 2000), cost estimates provided in the FS are expected to provide a level of accuracy of +50 to –30 percent. A more detailed cost estimate will be prepared during the Remedial Design phase.

Capital costs presented in this report include allowances for engineering (12-15%), construction management (8-10%), project management costs (6-8%) and contingency

(15%). The present net worth is based on the assumed project duration (i.e., time to closure), and it assumes a 7% discount rate and no inflation factor in accordance with U.S. EPA Guidance (U.S. EPA, 2000).

The anticipated remedial time frames used for the cost evaluation and effectiveness evaluation of each alternative are based upon conservative estimates and an evaluation of current site remediation trends. Appendix C provides graphs of the remediation trends in the site monitoring wells. First order decay (exponential) trendlines are used to approximate the remediation trends in each well. Calculations of the total VOC concentrations in the site monitoring wells based upon extrapolations of the trendlines are provided in Table C-1. Through the remedial actions proposed in each of the alternatives, groundwater VOC concentrations would be expected to be decreased to levels that would fulfill the applicable RAOs in the anticipated remedial time frames for each alternative.

A cost summary of the alternatives described in this report is presented in Table 6-2. The estimated capital costs, O&M costs, and present net worth costs are presented in Appendix A.

6.1.8 State Acceptance

This evaluation criterion assesses the technical and administrative issues and concerns that the state of Illinois may have about each alternative. This criterion will be addressed in the ROD after comments on this FS are received. In addition, to the extent possible, State acceptance will be discussed in the Proposed Plan issued for public comment.

6.1.9 Community Acceptance

This evaluation criterion evaluates the issues and concerns that the public may have regarding each of the alternatives. The analysis will address those alternatives, which the community supports, has reservations about, or opposes. Community input regarding the FS will be solicited during the public comment period, during which time this FS report will be available for public review. Therefore, this criterion has not been addressed in this FS report, but will be addressed in the ROD after public comments on this FS report and the Proposed Plan are received.

6.2 DETAILED ANALYSIS OF ALTERNATIVES

This section provides the detailed analysis of the alternatives developed in Section 5 based on the nine evaluation criteria. These alternatives were formulated for each area of concern and address both the on and off-property groundwater issues. A description of each alternative is given below.

Table 6-3 presents the detailed analysis of alternatives based on the nine evaluation criteria and provides an overall assessment of whether the alternative addresses the requirements of the criteria in the form of a symbolic rating consisting of the following:

○ - Alternative does not meet the requirements of the criteria.

⊙ - Alternative partially meets the requirements of the criteria.

● - Alternative meets the requirements of the criteria.

Table 6-3 also provides a summary description of the assessment of the alternative for each criterion. Anticipated project durations are also presented in Table 6-3 for each alternative. Table 6-4 presents a summary of the detailed analysis of the alternatives presenting the symbolic rating for each criterion.

6.2.1 Alternative 1: No Action

This alternative is the NCP required no action alternative. This alternative is required to be carried through to the detailed alternative analysis to provide a comparison of the other analyzed alternatives to this no action option. Under current conditions, the ISCA is containing VOCs in On-Property Groundwater Plume, and private wells with VOCs concentrations equal to or exceeding applicable MCLs are on point-of-entry treatment systems. The No Action alternative would include:

- No further remedial action taken at the site.
- Discontinuing use of the currently operating ISCA treatment system.
- No further use of the point-of-entry treatment systems currently installed at the four private wells in the Blackhawk Acres subdivision.
- No further groundwater monitoring.

6.2.2 Alternative 2: On-Property Groundwater Pump and Treat, and Off-Property Groundwater Plumes Exposure Control

This alternative includes the following measures for the Groundwater VOC Source Area and the On-Property Groundwater Plume:

- Continued operation of the ISCA groundwater control system on the Beloit property. This continued operation includes continued quarterly groundwater monitoring and reporting of the existing on-site and off-site monitoring wells.
- Institution of a deed restriction that prohibits the use of groundwater on-site for potable purposes.
- Potential action in the Blackhawk Acres subdivision to control exposure to COPCs at the homes on Watts Avenue with VOCs above applicable MCLs. The need for an action will be based on the results of 5 years of continued

groundwater monitoring. Current data show COPCs to be declining, in one case to non-detectable concentrations. Therefore, the current point of entry treatment systems will be maintained for 5 years. If after 5 years of monitoring, the VOC concentrations are not below the MCLs or expected to reach the MCLs in a short time, an alternate control action will be provided. These control actions, if necessary, may include providing an alternative water supply (i.e., municipal water supply or redrilling of private wells to new aquifers, etc.) or extending the ISCA system into the nearby Blackhawk Acres subdivision to control this portion of the groundwater plume. For purposes of this FS an additional cost for the extension of the current groundwater extraction and treatment system into the Blackhawk Subdivision has been calculated for those alternatives that include a pump and treat system for the On-Property Groundwater Plume.

- Monitoring of the On-Property Groundwater Plume through either existing or additional new monitoring wells for VOCs will be included to measure the progress of the treatment and control measures employed.

This alternative incorporates exposure control measures for the Off-Property Groundwater Plumes. These measures may include the following actions:

- Establishment of a groundwater management zone over this area.

- Groundwater monitoring will be included as part of the exposure prevention measures for the Off-Property Groundwater Plumes. If through this monitoring, COPCs attributable to the NPL site are detected in private wells located south of the Beloit Corporation property, appropriate actions will be taken to control exposure through these wells. Such actions may include the connection of the residences to the municipal water system, redrilling these private wells to depths below where these COPCs are detected above their MCLs, or the installation/operation of point-of-entry treatment systems for these private wells/residences. A determination on the appropriate course of action, will be made on an individual basis for each affected residence, if necessary. However, for the purposes of this FS, costs for the connection of these residences south of the site to the municipal water supply have been assumed (see Table 6-4). Additionally, contingency costs for the connection of the affected residences in Blackhawk Acres to municipal water or redrilling of these wells to deeper depths have been included as part of this alternative if treatment is required beyond the operational lifetime of the existing point-of-entry systems.

It is important to note that this alternative is essentially a continuation of the existing site remediation efforts. This alternative assumes a project life (i.e., remedial time frame) of 30 years. This assumed project life is based on the continued presence of VOCs within the lower hydraulic conductivity source area groundwater at the erection bay, that would continue to migrate with the on-property groundwater to be captured by the ISCA extraction wells. Based upon the evaluation of current remediation trends conducted in Appendix C, this remedial time frame is appropriate to achieve the applicable RAOs.

Although concentrations in W23B (deep source area well) are increasing, continued operation of the ISCA in this area for an additional 30 years would be expected to extract the entire spill mass at current mass removal rates. However, the actual remedial time frame for this alternative may be more or less than 30 years depending upon the effectiveness of the actions implemented through this alternative.

6.2.3 Alternative 2a: On-Property Groundwater Pump and Treat, and Off-Property Groundwater Pump and Treat

This alternative includes the remediation measures for the Groundwater VOC Source Area and the On-Property Groundwater Plume as is outlined in Alternative 2 (Section 6.2.2).

This alternative includes the following measures for the Off-Property Groundwater Plumes:

- Construction of extraction wells and an air stripping system to treat groundwater. The treated groundwater would then be discharged into the Rock River.

    - Groundwater extraction would occur from four wells located from the edge of the 100 ug/L of total VOC isocontour to an extraction well on the north side of Main Street. Each well is assumed to have an extraction rate of 100 gallons per minute (gpm), for a total system extraction rate of at least 400 gpm. The projected performance of this system would be evaluated in the final design, and modifications would be made, if necessary, to the number and location of wells and their anticipated pumping rates.

    - The extracted groundwater would be conveyed by underground piping to a treatment building assumed to be located along the railroad easement property near the Rock River. The piping would have to cross six roadways and is assumed to travel along the railroad's property. If an easement from the railroad can not be obtained, piping would have to be installed in the right of way of the city streets.

    - Groundwater treatment would involve physical treatment by air stripping. In an air stripper, the surface area of a film of water is maximized while air is blown across it in the opposite direction of the water flow. VOCs at the air/water interface are volatilized, removing them from the water. The easiest compounds to strip are highly volatile and slightly soluble. The physical/chemical parameters of TCE, PCE, 1,1-DCE, and 1,2-DCE, the principal VOCs present, are such that they are readily strippable.

- Groundwater monitoring will also be included to evaluate the effectiveness of the pump and treat system. If through this monitoring, COPCs attributable to the NPL site are detected in private wells located south of the Beloit Corporation property, appropriate actions will be taken to control exposure through these wells. Such actions may include the connection of the residence to the municipal water system, redrilling the private wells to depths below where the COPCs are detected above their MCLs, or the installation/operation of point-of-entry treatment systems for these private wells/residences. A determination on the appropriate course of action, will be made on an individual basis for each affected residence, if necessary. However, for the purposes of this FS, costs for the connection of these residences south of the site to the municipal water supply have been assumed (see Table 6-4). Additionally, for the purposes of this FS, costs for the extension of the current groundwater extraction and treatment system into the Blackhawk Subdivision have been calculated for those alternatives that include a pump and treat system for the On-Property Groundwater Plume. Contingency costs for the connection of the affected residences in Blackhawk Acres to municipal water or redrilling of these wells to deeper depths have also been included as part of this alternative if treatment is required beyond the operational lifetime of the existing point-of-entry systems.

This alternative assumes a project life of 30 years. This assumed project life is based on the continued presence of VOCs within the low hydraulic conductivity source area groundwater at the erection bay that would continue to migrate with the on-property groundwater to be captured by the ISCA extraction wells. This is the same remedial time frame as Alternative 2, because the cleanup of the source area groundwater is assumed to be the limiting time frame for cleanup. Based upon the evaluation of current remediation trends conducted in Appendix C, this remedial time frame is appropriate to achieve the applicable RAOs. Although concentrations in W23B (deep source area well) are increasing, continued operation of the ISCA in this area for an additional 30 years would be expected to extract the entire spill mass at current mass removal rates. However, the actual remedial time frame for this alternative may be more or less than 30 years depending upon the effectiveness of the actions implemented through this alternative.

6.2.4 Alternative 3: Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control

This alternative includes the following measures for the Groundwater VOC Source Area and the On-Property Groundwater Plume:

- Institution of a deed restriction that prohibits the use of groundwater on-site for potable purposes.

- Implementation of in-situ treatment measures for the Groundwater VOC Source Area utilizing various potential process options. Examples of the process options that may potentially be employed include enhanced biodegradation, chemical oxidation, and/or physical treatment through an air sparge/soil vapor extraction or air stripping system. The selection will be based on which method will most cost effectively achieve the RAOs. For purposes of this FS, chemical oxidation is the option used for discussion and cost estimating. The performance of the in-situ treatment measure will be monitored through quarterly groundwater sampling.

- Monitoring of the On-Property Groundwater Plume and the Groundwater VOC Source Area through either existing or new monitoring wells for VOCs will be included to measure the progress of the treatment measures employed for the remediation of the Groundwater VOC Source Area. Downgradient affects on the On-Property Groundwater Plume and Off-Property Groundwater Plumes as a result of the treatment measures employed through this alternative will also be monitored.

This alternative incorporates exposure control measures for the Off-Property Groundwater Plumes. These measures may include the following actions:

- Establishment of a groundwater management zone over this area.

- Groundwater monitoring (on a quarterly basis) will be included as part of the exposure prevention measures for the Off-Property Groundwater Plumes. If through this monitoring, COPCs attributable to the NPL site are detected in private wells located south or east of the Beloit Corporation property, appropriate actions will be taken to control exposure through these wells. Such actions may include the connection of the residence to the municipal water system, redrilling these private wells to depths below where these COPCs are detected above their MCLs, or the installation/operation of point-of-entry treatment systems for these private wells/residences. A determination on the appropriate course of action will be made on an individual basis for each affected residence, if necessary. However, for the purposes of this FS, costs for the connection of these residences south of the site to the municipal water supply have been assumed (see Table 6-4). Additionally, contingency costs for the connection of the affected residences in Blackhawk Acres to municipal water or redrilling of these wells to deeper depths have been included as part of this alternative if treatment is required beyond the operational lifetime of the existing point-of-entry systems.

This alternative assumes a project life of 20 years. This assumed project life is based on the removal of the source of VOCs in the source area groundwater (i.e., the PCE in the groundwater at the erection bay) and the continued advection, dispersion, and dilution of the VOCs. Additionally, based upon the evaluation of current remediation trends conducted in Appendix C, this remedial time frame is appropriate to achieve the applicable RAOs. For the on-property and off-property groundwater plumes, the remedial trends such as those noted in well W43C (which is beyond the influence of the ISCA), would be expected to be mirrored in the on-property and off-property wells. The actual remedial time frame for this alternative may be more or less than 20 years depending upon the effectiveness of the actions implemented through this alternative.

6.2.5 Alternative 3a: Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat

This alternative includes the remediation measures for the Groundwater VOC Source Area and the On-Property Groundwater Plume as is outlined in Alternative 3 (Section 6.2.4).

This alternative includes the following measures for the Off-Property Groundwater Plumes:

- Construction of extraction wells and a groundwater treatment system. The treated groundwater would then be discharged into the Rock River. Refer to Alternative 2a (Section 6.2.3) for details on this measure of the alternative.

- Groundwater monitoring will also be included to evaluate the effectiveness of the pump and treat system. If through this monitoring, COPCs attributable to the NPL site are detected in private wells located south of the Beloit Corporation property, appropriate actions will be taken to control exposure through these wells. Such actions may include the connection of the residence to the municipal water system, redrilling the private wells to depths below where the COPCs are detected above their MCLs, or the installation/operation of point-of-entry treatment systems for these private wells/residences. A determination on the appropriate course of action will be made on an individual basis for each affected residence, if necessary. However, for the purposes of this FS, costs for the connection of these residences south of the site to the municipal water supply have been assumed (see Table 6-4). Additionally, contingency costs for the connection of the affected residences in Blackhawk Acres to municipal water or redrilling of these wells to deeper depths have been included as part of this alternative if treatment is required beyond the operational lifetime of the existing point-of-entry systems.

This alternative assumes a project life of less than 20 years. This assumed project life is based on the removal of the source of VOCs in groundwater (i.e., the PCE in the groundwater at the erection bay), the continued advection, dispersion, and dilution of the VOCs, and the implementation of the off-property treatment system. Additionally, based upon the evaluation of current remediation trends conducted in Appendix C, this remedial time frame is appropriate to achieve the applicable RAOs. For the on-property and off-property groundwater plumes, the remedial trends such as those noted in well W43C (which is beyond the influence of the ISCA), would be expected to be mirrored in the on-property and off-property wells. The actual remedial time frame for this alternative is estimated at less than 20 years (the lifetime of Alternative 3), however it depends upon the effectiveness of the actions implemented through this alternative. This time frame is estimated to be less than Alternative 3 because of the Off-Property Pump and Treat system.

6.2.6 Alternative 4: On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plume Exposure Control

This alternative includes the following measures for the Groundwater VOC Source Area and the On-Property Groundwater Plumes:

- Continued operation of the ISCA groundwater control system on the Beloit Property. This continued operation includes continued quarterly groundwater monitoring and reporting of the existing on-site and off-site monitoring wells.

- Institution of a deed restriction that prohibits the use of groundwater on-site for potable purposes.

- The action for the three private wells in Blackhawk Acres Subdivision will be the same as in Alternative 2.

- Implementation of in-situ treatment measures for the source area of the On-Property Groundwater Plume utilizing various potential process options. Examples of the process options that may potentially be employed include enhanced biodegradation, chemical oxidation, and/or physical treatment through an air sparge/soil vapor extraction system. The selection will be based on which method will most cost effectively achieve the RAOs. For purposes of this FS, chemical oxidation is the option used for discussion and cost estimating. The performance of the in-situ treatment measures will be monitored through quarterly groundwater sampling.

- Monitoring of the On-Property Groundwater Plume through either existing or new monitoring wells for VOCs will also be included as part of both these On-Property Groundwater Plume source treatment and control measures. This monitoring will also measure the progress of the treatment and control measures employed.

This alternative incorporates exposure control measures for the Off-Property Groundwater Plume. These measures may include the following actions:

- Establishment of a groundwater management zone over this area.

- Groundwater monitoring will also be included as part of the exposure control measures for the Off-Property Groundwater Plumes. If through this monitoring, COPCs attributable to the NPL site are detected in private wells located south or east of the Beloit Corporation property, appropriate actions will be taken to control exposure through these wells. Such actions may include the connection of the residences to the municipal water system, redrilling these private wells to depths below where these COPCs are detected above their MCLs, or the installation/operation of point-of-entry treatment systems for these private wells/residences. A determination on the appropriate course of action will be made on an individual basis for each affected residence, if necessary. However, for the purposes of this FS, costs for the connection of these residences south of the site to the municipal water supply have been assumed (see Table 6-4). Additionally, for the purposes of this FS, costs for the extension of the current groundwater extraction and treatment system into the Blackhawk Subdivision have been calculated for those alternatives that include a pump and treat system for the On-Property Groundwater Plume.

This alternative assumes a project life of 15 years. This assumed project life is based on the removal of the source of VOCs in the source area groundwater (i.e., the PCE in the groundwater at the erection bay) and the use of an on-property groundwater pump and treat system to further remove VOCs from the groundwater. As indicated through the analyses conducted in Appendix C, these actions, as well as the potential extension of the ISCA treatment system into the Blackhawk Acres Subdivision, would be expected to only enhance and accelerate the trend towards declining VOC concentrations in the groundwater downgradient of the source area. The actual remedial time frame for this alternative may be more or less than 15 years depending upon the effectiveness of the actions implemented through this alternative.

6.2.7 Alternative 4a: On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat

This alternative includes the remediation measures for the On-Property Groundwater Plume and Groundwater VOC Source as is outlined in Alternative 4 (Section 6.2.6).

This alternative includes the following measures for the Off-Property Groundwater Plumes:

- Construction of extraction wells and a groundwater treatment system. The treated groundwater would then be discharged into the Rock River. Refer to Alternative 2a (Section 6.2.3) for details on this measure of the alternative.

- Groundwater monitoring will also be included to evaluate the effectiveness of the pump and treat system. If through this monitoring, COPCs attributable to the NPL site are detected in private wells located south of the Beloit Corporation property, appropriate actions will be taken to control exposure through these wells. Such actions may include the connection of the residence to the municipal water system, redrilling the private wells to depths below where the COPCs are detected above their MCLs, or the installation/operation of point-of-entry treatment systems for these private wells/residences. A determination on the appropriate course of action will be made on an individual basis for each affected residence, if necessary. However, for the purposes of this FS, costs for the connection of these residences south of the site to the municipal water supply have been assumed (see Table 6-4). Additionally, for the purposes of this FS, costs for the extension of the current groundwater extraction and treatment system into the Blackhawk Subdivision have been calculated for those alternatives that include a pump and treat system for the On-Property Groundwater Plume.

This alternative assumes a project life of 15 years. This assumed project life is based on the removal of the source of VOCs in the source area groundwater (i.e., the PCE in the groundwater at the erection bay) and the use of an on-property groundwater pump and treat system to further remove VOCs from the groundwater. As indicated through the analyses conducted in Appendix C, these actions, as well as the potential extension of the ISCA treatment system into the Blackhawk Acres Subdivision, would be expected to only enhance and accelerate the trend towards declining VOC concentrations in the groundwater downgradient of the source area. The actual remedial time frame for this alternative may be more or less than 15 years depending upon the effectiveness of the actions implemented through this alternative. This is the same remedial time frame as Alternative 4, because the time frame for remediation of the On-Property Plume and Off-Property Plumes, without a continuing source area, is estimated to be about the same.

N:\Jobs\208\2402\01\wp\rpt\99_FS Sec 6 revised 2.doc

7.0 COMPARISON OF ALTERNATIVES

In Section 6, seven remedial action alternatives were individually assessed against seven of the nine evaluation criteria. In this section, a comparative analysis is conducted to evaluate the relative performance of each alternative in relation to each of the seven criteria. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to another, so the relative strengths can be identified. These strengths, combined with risk management decisions made by the IEPA, will serve as the rationale for selecting a preferred alternative and provide a transition between the RI/FS and the ROD. This comparative analysis is presented in Table 7-1.

7.1 COMPARATIVE ANALYSIS

To perform a comparative analysis of the seven alternatives presented, a comparative analysis decision matrix was used and is presented in Table 7-1. A comparative analysis decision matrix is a tool, which compares each alternative to each of the analysis criteria. A value is assigned to each alternative rating how the alternative compares to the other alternatives when considering only that particular analysis criterion. Therefore, more than one alternative may receive the same rating value, if each of the alternatives is equivalent for a specific criterion. A value of 1 through 9 is used, in this case a value of 9 reflects the benefits of the alternative, and a value of 1 reflects the limitations of the alternative. The numerical ratings were divided into three categories based on a symbolic rating also assigned on Table 7-1:

○ - Alternative does not meet the requirements of the criterion (numerical rating of 1 to 3 assigned).

⊙ - Alternative partially meets the requirements of the criterion (numerical rating of 4 to 6 assigned).

● - Alternative meets the requirements of the criterion (numerical rating of 7 to 9 assigned).

The ratings for each alternative are totaled, and the alternatives with the highest totals may be considered the preferred alternatives that emerge based on the detailed analysis and comparative analysis assessment of the seven criteria being evaluated.

7.2 COMPARISON OF NINE CRITERIA

The nine evaluation criteria used, are the same as those summarized in Section 6.1. Summaries of the comparative analysis results are provided in the following sections. Details of the comparative analysis of the alternatives are presented in Table 7-1.

7.2.1 Overall Protection of Human Health and the Environment

This criterion addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the highest rating of 8.5.

Alternative 4a – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat received the second highest rating of 8.3.

7.2.2 Compliance with ARARs

This criterion considers factors such as compliance with chemical, location, and action specific ARARs. Potential ARARs for the developed remedial alternatives are summarized in Table 6-1.

Alternatives 2 to 4a all received the highest rating of 9.0. Only Alternative 1 – No Action would not be in compliance with the ARARs.

7.2.3 Long-Term Effectiveness and Permanence

This criterion describes factors such as residual risks remaining following implementation of the remedy, and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

Alternative 4a – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat received the highest rating of 9.0.

Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 8.5.

7.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion considers factors such as the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate.

Alternative 4a – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat received the highest rating of 9.0.

Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 8.5.

7.2.5 Short-Term Effectiveness

This criterion considers factors such as additional risks, which may be posed to the community, workers, and the environment during implementation of the remedy. In addition, the time required to achieve remedial action objectives is discussed.

Alternative 2 – On-Property Groundwater Pump and Treat, and Groundwater Pump and Treat received the highest rating of 9.0.

Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 8.0.

7.2.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services.

Alternatives 1 – No Action received the highest rating of 9.0.

Alternative 2 – On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control; Alternative 3 – Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control; and 4 – On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 8.5.

7.2.7 Cost

This criterion considers factors such as capital costs, annual O&M costs, and present net worth costs. Cost estimating was performed for Alternatives 1 through 4a for capital, O&M, and present net worth costs. These costs are summarized in Table 6-2. For purposes of comparison, present net worth costs assume the life of each alternative listed in Chapter 6, at a 7% discount rate.

Alternative 1 – No Action received the highest rating of 9.0.

Alternative 3 – Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 7.1.

7.2.8 State Acceptance

This criterion was not rated in the comparative analysis, as it will be addressed in the ROD after comments on this FS are received. In addition, to the extent possible, State acceptance will be discussed in the Proposed Plan issued for public comment.

7.2.9 Community Acceptance

This criterion was not rated in the comparative analysis, as it will be addressed in the ROD after public comments on this FS and the Proposed Plan are received.

7.3 SUMMARY OF COMPARISON OF ALTERNATIVES

Based on the numeric ratings assigned in Table 7-1 as part of the comparative analysis of alternatives, the alternatives that emerged with the highest total numeric ratings were:

Alternative 4 – On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control received the highest rating of 56.3.

Alternative 3 – Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control received the second highest rating of 55.3.

N:\Jobs\208\2402\01\wp\rpt\99_FS Sec 7 revised 2.doc

8.0 REFERENCES

Berg, Kempton and Stecyk, 1984. *Geology for Planning in Boone and Winnebago Counties,* I.D.E.N.R., State Geologic Survey Division, Circular 531, 60 p., p. 3-7, Hacket, 1960.

Hackett, James E., 1960. *Groundwater Geology of Winnebago County, Illinois,* Illinois State Geological Survey, Report of Investigations, 213, 64 p.

HEAST (Health Effects Assessment Summary Tables), 1994. U.S. Environmental Protection Agency, Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Cincinnati, Ohio.

Illinois Environmental Protection Agency (IEPA), 1996. *Tiered Approach to Corrective Action Objectives.* Illinois Register Part 742.

IRIS (Integrated Risk Information System), 1996. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment.

Montgomery Watson, 1995. *Technical Memorandum 2, Beloit Corporation.*

Montgomery Watson, 1995b. *Engineering Evaluation and Cost Analysis, Source Control Removal Action.*

Montgomery Watson, 1996. *Removal Action Design Report.*

Montgomery Watson, 1997. *Technical Memorandum 3, Beloit Corporation*

Montgomery Watson, 1998. *Technical Memorandum 4, Beloit Corporation*

Montgomery Watson, 1999. *Remedial Investigation Report.*

Montgomery Watson, 2001. *Baseline Risk Assessment.*

R.S. Means Company, Inc., 2001. *Building Construction Cost Data 59th Annual Edition.* Construction Publishers & Consultants, Kingston MA.

U.S. EPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.* Publication No. EPA/540/G-89/004, Office of Solid Waste and Emergency Response (OSWER).

U.S. EPA, 1989. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A).* EPA/540/1-89-002. (RAGS, Vol. I).

U.S. EPA, 1990. *National Oil and Hazardous Substances Pollution Contingency Plan.* Federal Register 55:8666-8865 (March 8, 1990).

U.S. EPA, 1991a. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions.* OSWER Directive 9355.0-3.0 (April 22, 1991).

U.S. EPA, 1991b. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual.* *Supplemental Guidance.* *"Standard Default Exposure Factors".* Office of Emergency and Remedial Response. Washington, D.C. OSWER Directive: 9285.6-03.

U.S. Environmental Protection Agency (U.S. EPA), 1991c. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives),* Publication 9285.7-01C, (RGS, Vol. I, Part C).

U.S. EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, EPA Publication 540-R-00-002, OSWER Publication 9355.0-75.

Warzyn, 1993. *Technical Memorandum 1, Beloit Corporation.*

LAS/vlr/ndj/KJQ/BAI
N:\JOBS\208\2402\01\WP\RPT\99_FS SEC 8.DOC
2082402.01180101-MAD1

TABLES

Table 3-1
Detection of Chemicals By Medium and Area
Feasibility Study
Beloit Corporation, Rockton Facility
Rockton, Illinois

	On-Site All depths (5)	On-Site surface(7)	On-Site 0-10 ft(6)	Off-Site All depths	Off-Site surface	Sediment Maximum	Monitoring Wells (8)	Private Wells All Wells	PW1(1)	PW2(2)	PW3(3)	PW4(4)
VOLATILES												
Chloromethane							X	X				X
Methylene chloride								X				X
Acetone	X	X	X			X						
Carbon disulfide				X			X					
1,1-Dichloroethene							X	X	X			
1,1-Dichloroethane	X						X	X		X		X
1,2-Dichloroethene (cis)							X					
Chloroform				X				X			X	
1,2-Dichloroethane							X					
2-Butanone	X			X		X						
1,1,1-Trichloroethane	X						X	X	X	X		X
Carbon tetrachloride							X					
Trichloroethene							X	X		X		X
Benzene				X								
4-Methyl-2-pentanone				X								
2-Hexanone	X			X								
Tetrachloroethene	X	X	X				X	X	X			X
Toluene	X	X	X	X								
Ethylbenzene	X		X			X						
Xylenes (mixed)	X		X			X						
Dichlorodifluoromethane								X				X
SEMIVOLATILES			X									
Phenol	X						X					
1,4-Dichlorobenzene								X				X
2-Methylphenol	X											
4-Methylphenol	X					X						
2,4-Dimethylphenol	X											
Naphthalene	X		X			X						
2-Methylnaphthalene	X					X						
Dimethylphthalate							X					
Acenaphthylene						X						
Acenaphthene n	X	X	X			X						
4-Nitrophenol	X	X	X									
Dibenzofuran	X	X	X			X						
Diethylphthalate							X					
Fluorene n	X	X	X			X						
Phenanthrene n	X	X	X	X	X	X						
Anthracene n	X	X	X	X	X	X						
Di-n-butylphthalate				X	X	X	X					
Fluoranthene n	X	X	X	X	X	X						
Pyrene n	X	X	X	X	X	X						
Butylbenzylphthalate				X	X							
Benzo(a)anthracene c	X	X	X	X	X	X						
Chrysene c	X	X	X	X	X	X						
bis(2-ethylhexyl)phthalate	X	X	X	X	X							
Di-n-octyl Phthalate	X	X	X									
Benzo(b)fluoranthene c	X	X	X	X	X	X						
Benzo(k)fluoranthene c	X	X	X	X	X	X						
Benzo(a)pyrene c	X	X	X	X	X	X						
Indeno(1,2,3-cd)pyrene c	X	X	X	X	X	X						
Dibenz(a,h)anthracene c	X	X	X	X	X	X						
Benzo(g,h,i)perylene n	X	X	X	X	X	X						
Carbazole	X	X	X									

Table 3-1
Detection of Chemicals By Medium and Area
Feasibility Study
Beloit Corporation, Rockton Facility
Rockton, Illinois

	On-Site All depths [5]	On-Site surface[7]	On-Site 0-10 ft[6]	Off-Site All depths	Off-Site surface	Sediment Maximum	Monitoring Wells [8]	Private Wells All Wells	PW1[1]	PW2[2]	PW3[3]	PW4[4]
PESTICIDES/PCBs			X									
Heptachlor	X						X					
Aldrin	X	X	X									
4,4'-DDE												
Endrin												
4,4'-DDT	X	X	X									
Methoxychlor	X											
Endrin ketone	X											
PCB	X	X	X									
Endrin Aldehyde							X					
METALS			X									
Aluminum	X	X	X	X	X	X	X					
Antimony	X	X	X	X	X							
Arsenic	X	X	X	X	X	X	X					
Barium	X	X	X	X	X	X	X					
Beryllium	X	X	X									
Cadmium	X	X	X	X	X	X	X					
Calcium	X	X	X	X	X	X	X					
Chromium III			X									
Chromium VI	X	X		X	X	X	X					
Cobalt	X	X	X	X	X	X	X					
Copper	X	X	X	X	X	X	X					
Iron	X	X	X	X	X	X	X					
Lead	X	X	X	X	X	X	X					
Magnesium	X	X	X	X	X	X	X					
Manganese	X	X	X	X	X	X	X					
Mercury	X	X	X	X	X	X	X					
Nickel	X	X	X	X	X	X	X					
Potassium	X	X	X	X	X	X	X					
Selenium	X	X	X			X	X					
Silver	X	X	X	X	X							
Sodium	X	X	X	X	X		X					
Thallium						X						
Vanadium	X	X	X	X	X	X						
Zinc	X	X	X	X	X	X	X					
Cyanide	X	X	X				X					

NOTES:

1. X indicates that the chemical was detected in the medium and or area. The detection of an analyte does not signify that the chemical was at a concentration that would cause it to be labeled a chemical of potential concern.
2. Private wells PW1 and PW2 were tested as if there were no point of use treatment system (Hypothetical), these wells actually have point of use treatment systems installed by the IEPA
3. Private wells PW3 and PW4 do not have point of use treatment systems.
4. Essential nutrients are not included in this analysis.

FOOTNOTES:

1. PW1 = private wells for specific Southern Blackhawk Subdivision Residents.
2. PW2 = private wells for specific Eastern Blackhawk Subdivision Residents.
3. PW3 = private wells for specific Northern Blackhawk Subdivision Residents, that have chloroform affected groundwater.
4. PW4 = private wells for specific Blackhawk Subdivision Residents that do not have point of use treatment systems.
5. All depths = compounds in all the soil samples above the water table.
6. 0 to 10 ft = compounds in soil samples from the 0 to 10 foot interval only.
7. Surface = compounds in surface samples only (0-1 ft).
8. VOCs considered COPCs in monitoring wells were considered potentially COPCs in the Rock River surface water south of the Village of Rockton where the plume discharges to the river.

TABLE 3-2

Matrix of Potentially Complete Exposure Pathways Under Current Land Use Conditions

Feasibility Study
Beloit Corporation – Blackhawk Facility
Rockton, Illinois

Exposure Medium/ Exposure Route	Residents on the NPL Site (Children and Adults)	Recreational Users and Beloit Corporation Trespassers (Nearby Resident Children)	Beloit Corporation Employees	Construction Workers Working on the Beloit Corporation Property
Groundwater				
Inhalation	X	---	---	---
Ingestion	X	---	---	---
Dermal Contact	X	---	---	
Surface Water – Adjacent to Beloit Corp. Property				
Inhalation	---	---	---	---
Ingestion	---	---	---	---
Dermal Contact	---	---	---	---
Surface Water – At Point of Groundwater Discharge to Rock River				
Inhalation	---	---	---	---
Ingestion	X	X	---	---
Dermal Contact	X	X	---	---
Sediment – Adjacent to Beloit Corp. Property				
Inhalation	---	---	---	---
Ingestion	---	X	---	---
Dermal Contact	---	X	---	---

Exposure Medium/ Exposure Route	Residents on the NPL Site (Children and Adults)	Recreational Users and Beloit Corporation Trespassers (Nearby Resident Children)	Beloit Corporation Employees	Construction Workers Working on the Beloit Corporation Property
Sediment – At Point of Groundwater Discharge to Rock River				
Inhalation	---	---	---	---
Dermal Contact	---	---	---	---
Ingestion	---	---	---	---
Soils on the NPL Site				
Inhalation	---	---	X	X
Dermal Contact	---	X (as trespasser on Beloit Corporation Property)	X	X
Ingestion	---	X (as trespasser on the Beloit Corporation Property)	X	X
Air on the NPL Site				
Fugitive Vapor Inhalation	---	---	X	X
Indoor Vapor Inhalation	---	---	---	---
Dust Inhalation	---	---	X	X
Food				
Locally grown food ingestion	---	---	---	---
Wild game ingestion	---	---	---	---
Fish ingestion	---	---	---	---

General Notes:

1. "---" = Pathway is considered incomplete or insignificant from a public health perspective for this population, and is therefore addressed qualitatively within the BIRA (Montgomery Watson, 2000). See Section 5.2 of the BIRA for further details concerning why the exposure pathway was considered incomplete or insignificant.

2. X = Pathway is considered potentially complete for this population and is quantitatively evaluated in the BIRA. See Section 5.2 of the BIRA for further details concerning why the exposure pathway was considered complete.

Table 3-3

Summary Of Health Risk Estimates Under Current Site Conditions

Feasibility Study
Beloit Corporation, Rockton Facility
Rockton, Illinois

Final BIRA Table Index No.	Receptor	Medium	Exposure Point	Hazard Index By Route				Cancer Risks By Route			
				Dermal	Ingestion	Inhalation	Total	Dermal	Ingestion	Inhalation	Total
Exposed Population: Nearby Residents											
Table D-4	Northern Blackhawk Acres Residents (1)	Groundwater	Tap	4.0E-04	3.9E-02	1.3E-01	2E-01	1.0E-08	1.0E-06	4.5E-05	5E-05
Table D-5	Other Blackhawk Acres Residents (2)	Groundwater	Tap	1.4E-03	4.2E-02	3.2E-02	8E-02	2.1E-07	4.1E-06	2.4E-06	7E-06
Table D-5	Specific Rockton Resident (3)	Groundwater	Tap	8.1E-04	3.3E-02	6.7E-04	3E-02	8.0E-08	1.9E-06	1.5E-06	3E-06
Table D-6	Rock River Recreational User	Surface water, modeled	Rock River South of Village of Rockton	1.8E-06	3.8E-07	0.0E+00	2E-06	1.3E-10	2.9E-11	0.0E+00	2E-10
Table D-7	Rock River Recreational Users	Sediment	Rock River Adjacent to Beloit Corporation Property	1.2E-01	3.4E-02	0.0E+00	2E-01	6.7E-07	1.1E-06	0.0E+00	2E-06
Table D-8	Trespasser	Soil	On-Beloit Corporation Property Surface Soil	2.5E-01	6.4E-02	0.0E+00	3E-01	1.2E-06	1.3E-06	0.0E+00	3E-06
Total Risks											
Tables D-3,6,7,8	Northern Blackhawk Acres Residents	All Media	Multiple	3.8E-01	1.4E-01	1.3E-01	6E-01	1.9E-06	3.4E-06	4.5E-05	5E-05
Tables D-4,6,7,8	Other Blackhawk Acres Residents (2)	All Media	Multiple	3.8E-01	1.4E-01	3.2E-02	6E-01	2.1E-06	6.5E-06	2.4E-06	1E-05
Tables D-5,6,7,8	Specific Blackhawk Acres Resident	All Media	Multiple	3.8E-01	1.3E-01	6.7E-04	5E-01	2.0E-06	4.2E-06	1.5E-06	8E-06
Exposed Population: On-Site Employees											
Table D-9	Employees	Soil	On-Beloit Corporation Property Surface Soil	3.4E-01	2.0E-02	1.5E-02	4E-01	1.2E-06	8.4E-07	2.5E-07	2E-06
Table D-10	Future Employees	Soil	On-Beloit Corporation Property Surface Soil	**1.3E+00**	8.0E-02	1.5E-02	**1E+00**	5.0E-06	3.3E-06	2.5E-07	9E-06
Exposed Population: Construction Workers											
Table D-11	Construction Worker	Soil	On-Beloit Corporation Property Excavation	8.6E-02	9.0E-02	6.9E-02	2E-01	1.5E-07	2.3E-07	3.1E-08	4E-07

Note:
This table summarizes the health risks by exposed population and medium. Refer to the BIRA risk tables indexed to review the chemical-specific risk estimates. It should be noted that a Hazard Index (HI) less than one indicates no noncarcinogenic health effects are expected in the exposed population. In addition, a cumulative excess cancer risk (CR) below $1x10^{-4}$ is within the health protective risk range of $1x10^{-6}$ to $1x10^{-4}$.

Footnotes:
1. These represent the potential risks for the residences in the Northern Blackhawk Acres Subdivision that do not have point-of-use groundwater treatment systems, and use groundwater containing chloroform below Federal Drinking Water standards. It was assumed for purposes of this scenario that a resident consumed on a daily basis all of their drinking water from their private well in the Northern Blackhawk Subdivision area for thirty (30) years, and the concentration of chloroform in the groundwater was assumed to be equivalent to the average concentration in the private well where the maximum concentration of chloroform was detected.
2. These represent the potential risks for the other residences throughout the Blackhawk Acres Subdivision that do not have point-of-use groundwater treatment systems, but use groundwater containing concentrations of chemicals below Federal Drinking Water Standards. It was assumed for purposes of this scenario that a resident consumed on a daily basis all of their drinking water from their private well in the Blackhawk Subdivision for thirty (30) years, and the concentration of the chemical in the groundwater was assumed to be equivalent to the maximum concentration detected in any of the other private wells not having a point of use treatment. Note that the chloroform affected wells in the Northern area have been handled separately (refer to Table D-4).

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
Groundwater VOC Source Area	No Action	No Action	No Action	No Action.	NCP requires No Action to be carried through to detailed analysis of alternatives.
	Institutional Controls	Deed Restrictions	Groundwater Use Restrictions	Restrictions would be instituted for the use of on-property groundwater and prohibiting the installation of new wells.	Potentially viable.
	Monitoring	Monitoring	Groundwater Monitoring	Long-term monitoring of groundwater wells to monitor degradation, dissipation, and migration of COPCs in the groundwater.	Potentially viable.
			Natural Attenuation Monitoring	Long-term monitoring of groundwater wells for indicators of natural biodegradation.	Potentially viable.
	Gradient Controls	Containment	Slurry Wall	Containment of groundwater source area and prevention of further plume migration through installation of an impermeable barrier in the path of groundwater flow.	Potentially viable.
			Groundwater Extraction	Containment of groundwater contaminant source through extraction of groundwater to prevent further plume migration.	Potentially viable.
		Groundwater Recharge Elimination	Impermeable Surface Cap	Installation of an impermeable cap over the entire groundwater source area to prevent further recharge and migration of the plume.	Not viable. Limited if any VOCs are present in the unsaturated zone, so an impermeable surface cap would be ineffective.
	Extraction and Ex-situ Treatment	Biological Treatment	Cometabolic Aerobic Biodegradation	Addition of specific compounds to feed bacteria that can cometabolize certain chemicals into non-hazardous compounds.	Potentially viable.
			Anaerobic Biodegradation	Addition of specific compounds to enhance the anaerobic biodegradation of specific chemicals in extracted groundwater.	Potentially viable.
			Aerobic Treatment	Conventional aerobic biotreatment of certain chemicals in extracted groundwater.	Not viable. Aerobic biodegradation of CVOCs is generally not effective.
		Chemical Treatment	Chemical Oxidation	Addition of compounds that oxidize certain chemicals to non-hazardous compounds.	Potentially viable.
			Chemical Precipitation	Addition of a chemical to precipitate certain chemicals from extracted groundwater.	Not viable. Technology is most efficient for metals.

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
Groundwater VOC Source Area (cont...)	Extraction and Ex-situ Treatment (continued)	Physical Treatment	Air Stripping	Mass transfer of VOCs from groundwater to the gaseous phase.	Potentially viable.
			Spray Evaporation	Dispersion of groundwater into tiny droplets with large surface area that facilitate the transfer of certain chemicals to the gaseous phase.	Potentially viable.
			Carbon Adsorption	Filtration of extracted groundwater through activated carbon filters which adsorb certain chemicals.	Potentially viable.
			Discharge to POTW	Discharge of extracted groundwater to the local POTW for treatment	Potentially viable.
			Ion Exchange	Removal of charged compounds from the groundwater.	Not viable. Non-charged chemicals are not amenable to this technology.
			Reverse Osmosis	Removal of chemicals from groundwater using microfiltration technology.	Potentially viable.
	In-Situ Treatment	Biological Treatment	Enhanced Biodegradation	Injection of specific compounds into plume area to feed bacteria that cometabolize certain chemicals into non-hazardous compounds.	Potentially viable.
		Chemical Treatment	Chemical Oxidation	Injection of compounds into groundwater that oxidize certain chemicals to non-hazardous compounds.	Potentially viable.
			Passive Treatment Wall	Installation of permeable wall in the path of groundwater flow which treats groundwater as it passes through the wall.	Potentially viable.
		Physical Treatment	Air Sparging/Soil Vapor Extraction	Injection of air into groundwater to transfer volatile chemicals to the gaseous phase and then the extraction of this air through separate wells in the unsaturated zone.	Potentially viable.
			Vacuum Vapor Extraction	Air injection into groundwater to transfer chemicals of potential concern to gaseous phase and subsequent extraction of air containing these chemicals in the same well.	Potentially viable.
			Thermal Vapor Extraction	In-situ heating of groundwater to transfer volatile chemicals to the gaseous phase and subsequent extraction of air c containing these chemicals in separate wells.	Potentially viable. Although, unlikely due to extreme energy requirements.
			Electrokinetic Treatment	Installation of electrodes into groundwater to move water, dissolved constituents and non-aqueous liquids between electrodes	Not viable. Technology is most effective for low hydraulic conductivity soils.

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
On-Property Groundwater Plume	No Action	No Action	No Action	No Action.	NCP requires No Action to be carried through to detailed analysis of alternatives.
	Institutional Controls	Deed Restrictions	Groundwater Use Restrictions	Restrictions would be instituted for the use of on-property groundwater and prohibiting the installation of new wells.	Potentially viable.
	Monitoring	Monitoring	Groundwater Monitoring	Long-term monitoring of groundwater wells to monitor degradation, dissipation, and migration of COPCs in the groundwater.	Potentially viable.
			Natural Attenuation Monitoring	Long-term monitoring of groundwater wells for indicators of natural biodegradation.	Potentially viable.
	Gradient Controls	Containment	Slurry Wall	Containment of groundwater plume and prevention of further plume migration through installation of an impermeable barrier in the path of groundwater flow.	Potentially viable.
			Groundwater Extraction	Containment of groundwater plume through extraction of groundwater to prevent further plume migration.	Potentially viable.
		Groundwater Recharge Elimination	Impermeable Surface Cap	Installation of an impermeable cap over the entire groundwater plume area to prevent further recharge and migration of the plume.	Not viable. This alternative would not be effective against groundwater influx from areas beyond limits of impermeable cap.
	Extraction and Ex-situ Treatment	Biological Treatment	Cometabolic Aerobic Biodegradation	Addition of specific compounds to feed bacteria that can cometabolize certain chemicals into non-hazardous compounds.	Potentially viable.
			Anaerobic Biodegradation	Addition of specific compounds to enhance the anaerobic biodegradation of specific chemicals in extracted groundwater.	Potentially viable.
			Aerobic Treatment	Conventional aerobic biotreatment of certain chemicals in extracted groundwater.	Not viable. Aerobic biodegradation of CVOCs is generally not effective.
		Chemical Treatment	Chemical Oxidation	Addition of compounds that oxidize certain chemicals to non-hazardous compounds.	Potentially viable.
			Chemical Precipitation	Addition of a chemical to precipitate certain chemicals from extracted groundwater.	Not viable. Technology is most efficient for metals.

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
On-Property Groundwater Plume (continued)	Extraction and Ex-situ Treatment (continued)	Physical Treatment	Air Stripping	Mass transfer of VOCs from groundwater to the gaseous phase.	Potentially viable.
			Spray Evaporation	Dispersion of groundwater into tiny droplets with large surface area that facilitate the transfer of certain chemicals to the gaseous phase.	Potentially viable.
			Carbon Adsorption	Filtration of extracted groundwater through activated carbon filters which adsorb certain chemicals.	Potentially viable.
			Discharge to POTW	Discharge of extracted groundwater to the local POTW for treatment	Potentially viable.
			Ion Exchange	Removal of charged compounds from the groundwater.	Not viable. Non-charged chemicals are not amenable to this technology.
			Reverse Osmosis	Removal of chemicals from groundwater using microfiltration technology.	Potentially viable.
	In-Situ Treatment	Biological Treatment	Enhanced Biodegradation	Injection of specific compounds into plume area to feed bacteria that cometabolize certain chemicals into non-hazardous compounds.	Potentially viable.
		Chemical Treatment	Chemical Oxidation	Injection of compounds into groundwater that oxidize certain chemicals to non-hazardous compounds.	Potentially viable.
			Passive Treatment Wall	Installation of permeable wall in the path of groundwater flow which treats groundwater as it passes through the wall.	Potentially viable.
		Physical Treatment	Air Sparging/Soil Vapor Extraction	Injection of air into groundwater to transfer volatile chemicals to the gaseous phase and then the extraction of this air through separate wells in the unsaturated zone.	Potentially viable.
			Vacuum Vapor Extraction	Air injection into groundwater to transfer chemicals of potential concern to gaseous phase and subsequent extraction of air containing these chemicals in the same well.	Potentially viable.
			Thermal Vapor Extraction	In-situ heating of groundwater to transfer volatile chemicals to the gaseous phase and subsequent extraction of air c containing these chemicals in separate wells.	Potentially viable. Although, unlikely due to extreme energy requirements.
			Electrokinetic Treatment	Installation of electrodes into groundwater to move water, dissolved constituents and non-aqueous liquids between electrodes.	Not viable. Technology is most effective for low hydraulic conductivity soils.

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
Off-Property Groundwater Plumes	No Action	No Action	No Action	No Action.	NCP requires No Action to be carried through to detailed analysis of alternatives.
	Institutional Controls	Deed Restrictions	Groundwater Management Zone	Restrictions would be instituted for the use of the off-property groundwater and prohibiting the installation of new wells.	Potentially viable.
		Water Supply Transfer	Connection to Municipal Water	Connection of residences with private well water supply MCL exceedances to the municipal water supply.	Potentially viable.
			Private Well Redrilling	Redrilling of private wells with water supply MCL exceedances to a deeper, unaffected aquifer.	Potentially viable.
	Monitoring	Monitoring	Groundwater Monitoring	Long-term monitoring of groundwater wells to monitor degradation, dissipation, and migration of COPCs in the groundwater.	Potentially viable.
			Natural Attenuation Monitoring	Long-term monitoring of groundwater wells for indicators of natural biodegradation.	Potentially viable.
	Gradient Controls	Containment	Slurry Wall	Containment of groundwater plume and prevention of further plume migration through installation of an impermeable barrier in the path of groundwater flow.	Potentially viable. This option would be cost-prohibitive due to the size of the wall required and access agreements necessary.
			Groundwater Extraction	Containment of groundwater plume through extraction of groundwater to prevent further plume migration. migration.	Potentially viable. Amount of groundwater required to be extracted would make this option economically unfeasible.
		Groundwater Recharge Elimination	Impermeable Surface Cap	Installation of an impermeable cap over the entire groundwater plume area to prevent further recharge and migration of the plume.	Not viable. This alternative would not be effective against groundwater influx from areas beyond limits of impermeable cap.

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
Off-Property Groundwater Plumes (continued)	Extraction and Ex-situ Treatment	Biological Treatment	Cometabolic Aerobic Biodegradation	Addition of specific compounds to feed bacteria that can cometabolize certain chemicals into non-hazardous compounds.	Potentially viable.
			Anaerobic Biodegradation	Addition of specific compounds to enhance the anaerobic biodegradation of specific chemicals in extracted groundwater.	Potentially viable.
			Aerobic Treatment	Conventional aerobic biotreatment of certain chemicals in extracted groundwater.	Not viable. Aerobic biodegradation of CVOCs is generally not effective.
		Chemical Treatment	Chemical Oxidation	Addition of compounds that oxidize certain chemicals to non-hazardous compounds.	Potentially viable.
			Chemical Precipitation	Addition of a chemical to precipitate certain chemicals from extracted groundwater.	Not viable. Technology is most efficient for metals.
		Physical Treatment	Air Stripping	Mass transfer of VOCs from groundwater to the gaseous phase.	Potentially viable.
			Spray Evaporation	Dispersion of groundwater into tiny droplets with large surface area that facilitate the transfer of certain chemicals to the gaseous phase.	Potentially viable. Although, additional risks posed by volatilization of chemicals into the ambient air.
			Carbon Adsorption	Filtration of extracted groundwater through activated carbon filters which adsorb certain chemicals.	Potentially viable.
			Discharge to POTW	Discharge of extracted groundwater to the local POTW for treatment	Potentially viable.
			Ion Exchange	Removal of charged compounds from the groundwater.	Not viable. Non-charged chemicals are not amenable to this technology.
			Reverse Osmosis	Removal of chemicals from groundwater using microfiltration technology.	Potentially viable.

TABLE 4-1
Identification and Screening of Remedial Technologies and Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Description	Applicability
Off-Property Groundwater Plumes (continued)	In-Situ Treatment	Biological Treatment	Enhanced Biodegradation	Injection of specific compounds into plume area to feed bacteria that cometabolize certain chemicals into non-hazardous compounds.	Potentially viable.
		Chemical Treatment	Chemical Oxidation	Injection of compounds into groundwater that oxidize certain chemicals to non-hazardous compounds.	Potentially viable.
			Passive Treatment Wall	Installation of permeable wall in the path of groundwater flow which treats groundwater as it passes through the wall.	Potentially viable.
		Physical Treatment	Air Sparging/Soil Vapor Extraction	Injection of air into groundwater to transfer volatile chemicals to the gaseous phase and then the extraction of this air through separate wells in the unsaturated zone.	Potentially viable.
			Vacuum Vapor Extraction	Air injection into groundwater to transfer chemicals of potential concern to gaseous phase and subsequent extraction of air containing these chemicals in the same well.	Potentially viable.
			Thermal Vapor Extraction	In-situ heating of groundwater to transfer volatile chemicals to the gaseous phase and subsequent extraction of air c containing these chemicals in separate wells.	Potentially viable. Although, unlikely due to extreme energy requirements.
			Electrokinetic Treatment	Installation of electrodes into groundwater to move water, dissolved constituents and non-aqueous liquids between electrodes.	Not viable. Technology is most effective for low hydraulic conductivity soils.

LEGEND

Not carried forward

LAS/las/vlr/BAI/KJQ
n:\208\2402\01\wp\tbl\FS_TABLE 4-2 revised.xls (Table 4-2)
2082402.01180101-MAD1

TABLE 4-2
Evaluation of Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Effectiveness	Implementability	Cost
Groundwater VOC Source Area	No Action	No Action	No Action	NCP requires No Action to be carried through to detailed analysis of alternatives.	Easily Implemented	Minimal capital cost to close existing ISCA treatment. No long term O&M costs
	Institutional Controls	Deed Restrictions	Groundwater Use Restriction	Achieves RA objective for future groundwater use scenario. Would require the use of other technologies to achieve all of RA objectives.	Can be implemented for any future sale of the property	Negligible costs.
	Monitoring	Monitoring	Groundwater Monitoring	Monitoring is effective in assessing if RA objectives are being met. Can be used in conjunction with other technologies.	Easily implemented.	Minimal capital costs, but long-term moderate O&M costs.
			Natural Attenuation Monitoring (1)	Does not achieve RA objectives. Site does not show signs of significant biodegradation. However, the dilution and dispersion processes of natural attenuation area occurring and can be monitored through routine groundwater monitoring. Will not protect against possible exposure to contaminated groundwater.	Easily implemented.	Minimal capital costs, but moderate long-term O&M costs.
	Gradient Controls	Containment	Slurry Wall (1) (2)	Does not achieve all of RA objectives alone. Can be accompanied with other technologies to achieve RA objectives.	Moderate difficulty to implement, will require special deep trenching equipment. Confining layer is 70 ft. bgs. Source area is under building, would need slurry wall to outline footprint of building approximately 3000 lf.	High capital costs, but negligible O&M costs.
			Groundwater Extraction	Doesn't achieve all of RA objectives alone, but can be accompanied with other technologies to achieve the RA objectives.	Easily implemented. Extracted water would likely require treatment prior to discharge.	Minimal capital costs and high long-term O&M costs (depending on treatment requirements)
	Extraction and Ex-situ Treatment	Biological Treatment	Cometabolic Aerobic Biodegradation (1) (2) (3)	May achieve RA objectives, but technically unproven	Difficult to implement. Would require significant bench scale testing and may not be reliable. Long remediation duration likely. May not meet discharge standards.	Would require construction of special treatment train, thus high capital costs. May require large amounts of chemicals, thus high O&M costs.
			Anaerobic Biodegradation (1) (2) (3)	May achieve RA objectives, but technically unproven.	Difficult to implement. Would require bench scale testing and may not be reliable. Long remediation duration likely. May not meet discharge standards.	Would require construction of special treatment train. High capital costs. Long-term moderate to high O&M costs.
		Chemical Treatment	Chemical Oxidation (2)(3)	Achieves RA objectives.	Moderate difficulty to implement. Would require special chemicals and treatment trains.	Moderate capital costs and short-term O&M costs. More costly than existing air stripping system.
		Physical Treatment	Air Stripping	Achieves RA objectives.	Easy to implement. Uses proven and readily available technology. Existing air stripper operating on site.	Low to no capital costs and moderate long-term O&M costs.
			Spray Evaporation (1) (3)	Achieves RA objectives, but has potential significant side health effects.	Easy to implement. Uses readily available equipment. Extracted water may require numerous cycles to achieve discharge standards.	Moderate capital costs and moderate to high long-term O&M costs
			Carbon Adsorption (3)	Achieves RA objectives.	Easy to implement. Uses readily available materials and equipment.	Moderate capital costs and high long-term O&M costs for carbon filters.
			Discharge to POTW (2) (3)	Achieves RA objectives, but may have side health effects within local sewer system.	Local sewerage district may not accept high volumes of extracted water. Would require installation of new sewer main to extraction points.	High capital costs and moderate long-term O&M costs. Uncertain discharge fees with local sewerage district.
			Reverse Osmosis (2) (3)	Achieves RA objectives	Would require construction of complex treatment system. O&M activities would be extensive.	High capital costs and high, long-term O&M costs.

TABLE 4-2
Evaluation of Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Effectiveness	Implementability	Cost
Groundwater VOC Source Area (continued)	In-Situ Treatment	Biological Treatment	Enhanced Biodegradation	Achieves RA objectives.	Easy to implement. Would require special chemicals and new borings for injections.	Moderate capital costs. Moderate but relatively short-term O&M costs.
		Chemical Treatment	Chemical Oxidation	Achieves RA objectives.	Easy to implement. Would require special chemicals and new borings for injections.	Moderate capital costs. Moderate, but relatively short-term O&M costs.
			Passive Treatment Wall (2) (3)	Achieves RA objectives.	Difficult to implement. Would require deep wall to key into underlying clay. Would require special equipment and materials. Remediation time would be very long.	High capital costs. Low but long-term O&M costs.
		Physical Treatment	Air Sparging/Soil Vapor Extraction	Achieves RA objectives. Effectiveness may be limited by the soil types present.	Would require installation of numerous sparge and extraction wells and treatment equipment. Long remediation duration likely.	Moderate capital costs. Moderate long term O&M costs.
			Vacuum Vapor Extraction	Achieves RA objectives.	Would require installation of numerous extraction wells and treatment equipment.	High capital costs. High and long-term O&M costs.
			Thermal Vapor Extraction (2) (3)	Achieves RA objectives.	Difficult to implement. Would require installation of numerous heating wells and vapor extraction wells. Long remediation duration likely.	High capital costs. High and long-term O&M costs.

TABLE 4-2
Evaluation of Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Effectiveness	Implementability	Cost
On-Property Groundwater Plume	No Action	No Action	No Action	NCP requires No Action to be carried through to detailed analysis of alternatives	Easily Implemented	Minimal capital cost to close existing ISCA treatment. No long term O&M costs
	Institutional Controls	Deed Restrictions	Groundwater Use Restriction	Achieves RA objective for future groundwater use scenario. Would require the use of other technologies to achieve all of RA objectives.	Can be implemented for any future sale of the property.	Negligible costs
	Monitoring	Monitoring	Groundwater Monitoring	Monitoring is effective in assessing if RA objectives are being met. Can be used in conjunction with other technologies.	Easily implemented	Minimal capital costs, but long-term moderate O&M costs
			Natural Attenuation Monitoring (1)	Does not achieve RA objectives. Site does not show signs of significant biodegradation. However, the dilution and dispersion processes of natural attenuation area occurring and can be monitored through routine groundwater monitoring. Will not protect against possible exposure to contaminated groundwater.	Easily implemented	Minimal capital costs, but moderate long-term O&M costs
	Gradient Controls	*Containment*	Slurry Wall (1)	Doesn't remediate groundwater, thus not achieving all of RA objectives.	Moderate difficulty to implement, will require special deep trenching equipment.	High capital costs, but negligible O&M costs.
			Groundwater *Extraction*	Doesn't achieve all of RA objectives alone, but can be *accompanied with other technologies to achieve the RA* objectives.	Easily implemented. Extracted water would likely *require treatment prior to discharge.*	Minimal capital costs and high long-term O&M costs (depending on treatment requirements)
	Extraction and Ex-situ Treatment	Biological Treatment	Cometabolic Aerobic Biodegradation (1) (2) (3)	May achieve RA objectives, but technically unproven.	Difficult to implement. Would require significant bench scale testing and may not be reliable. Long remediation duration likely. May not meet discharge standards.	Would require construction of special treatment train, thus high capital costs. May require large amounts of chemicals, thus high O&M costs.
			Anaerobic Biodegradation (1) (2) (3)	May achieve RA objectives, but technically unproven.	Difficult to implement. Would require bench scale testing and may not be reliable. Long remediation duration likely. May not meet discharge standards.	Would require construction of special treatment train. High capital costs. Long-term moderate to high O&M costs.
		Chemical Treatment	Chemical Oxidation	Achieves RA objectives.	Moderate difficulty to implement. Would require special chemicals and treatment trains.	Moderate capital costs and short-term O&M costs.
		Physical Treatment	Air Stripping	Achieves RA objectives.	Easy to implement. Uses proven and readily available technology.	Moderate capital costs and moderate long-term O&M costs.
			Spray Evaporation (1) (3)	Achieves RA objectives, but has potential significant side health effects.	Easy to implement. Uses readily available equipment. Extracted water may require numerous cycles to achieve discharge standards.	Moderate capital costs and moderate to high long-term O&M costs.
			Carbon Adsorption (3)	Achieves RA objectives.	Easy to implement. Uses readily available materials and equipment.	Moderate capital costs and high long-term O&M costs for carbon filters.
			Discharge to POTW (2) (3)	Achieves RA objectives, but may have side health effects within local sewer system.	Local sewerage district may not accept high volumes of extracted water. Would require installation of new sewer main to extraction points.	High capital costs and moderate long-term O&M costs. Uncertain discharge fees with local sewerage district.
			Reverse Osmosis (1) (2) (3)	Achieves RA objectives. However, other process options are as effective.	Would require construction of complex treatment system. O&M activities would be extensive.	High capital costs and high, long-term O&M costs

TABLE 4-2
Evaluation of Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Effectiveness	Implementability	Cost
On-Property Groundwater Plume (continued)	In-Situ Treatment	Biological Treatment	Enhanced Biodegradation (2)	Achieves RA objectives.	Moderate difficulty to implement. Would require special chemicals and large number of new borings for injections. Plume too large for effective in-situ treatment.	Moderate capital costs. Moderate but relatively short-term O&M costs
		Chemical Treatment	Chemical Oxidation (3)	Achieves RA objectives.	Moderate difficulty to implement. Would require special chemicals and large number of new borings for injections. Plume too large for effective in-situ treatment.	Moderate capital costs. Moderate, but relatively short-term O&M costs
			Passive Treatment Wall (2) (3)	Achieves RA objectives, if short-circuiting wall is avoided.	Difficult to implement. Would require long and deep remediation wall. Would require special equipment and materials. Length of time to remediate would also be very long.	High capital costs. Low but long-term O&M costs.
		Physical Treatment	Air Sparging/Soil Vapor Extraction	Achieves RA objectives. Effectiveness may be limited by the soil types present. Long remediation duration likely.	Would require installation of numerous sparge and extraction wells and treatment equipment. Plume too large for effective in-situ treatment.	Moderate capital costs. Moderate long term O&M costs.
			Vacuum Vapor Extraction (2) (3)	Achieves RA objectives.	Difficult to implement. Would require installation of special wells and equipment. Long remediation duration likely.	High capital costs. High and long-term O&M costs.
			Thermal Vapor Extraction (2) (3)	Achieves RA objectives.	Difficult to implement. Would require installation of numerous heating wells and vapor extraction wells. Long remediation duration likely.	High capital costs. High and long-term O&M costs.

TABLE 4-2
Evaluation of Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Effectiveness	Implementability	Cost
Off-Property Groundwater Plumes	No Action	No Action	No Action	NCP requires No Action to be carried through to detailed analysis of alternatives.	NCP requires No Action to be carried through to detailed analysis of alternatives	NCP requires No Action to be carried on to detailed analysis of alternatives
	Institutional Controls	Deed Restrictions	Groundwater Management Zone	Achieves RA objective for future groundwater use scenario. Would require the use of other technologies (e.g. monitoring, control, etc) to achieve all of objectives.	Would require local and state regulatory agency approval. Would likely require contingent use of other technologies.	Minimal capital costs and O&M costs (assuming no other contingencies are necessary).
		Water Supply Transfer	Connection to Municipal Water	Achieves RA objectives.	Would require access agreements and residential approval.	High capital costs and no O&M costs
			Private Well Redrilling	Achieves RA objectives.	Would require residential approval and agreements. Would require monitoring of new wells	High capital costs and moderate long-term O&M costs
	Monitoring	Monitoring	Groundwater Monitoring	Monitoring is effective in assessing if RA objectives are being met. Can be used in conjunction with other technologies.	Easily implemented.	Minimal capital costs, but long-term moderate O&M costs.
			Natural Attenuation Monitoring (1)	Does not achieve RA objectives. Site does not show signs of significant biodegradation. However, the dilution and dispersion processes of natural attenuation area occurring and can be monitored through routine groundwater monitoring. Will not protect against possible exposure to contaminated groundwater.	Easily implemented.	Minimal capital costs, but moderate long-term O&M costs.
	Gradient Controls	Containment	Slurry Wall (1) (2) (3)	Doesn't necessarily prevent exposure to groundwater, thus not achieving all of RA objectives.	Moderate difficulty to implement, will require special deep trenching equipment. Groundwater plume is too large to contain with a slurry wall 40 acres.	High capital costs, but negligible O&M costs.
			Groundwater Extraction (1) (3)	Doesn't necessarily prevent exposure to groundwater, thus not achieving all of RA objectives.	Easily implemented. Extracted water would likely require treatment prior to discharge.	Moderate capital costs, high long-term O&M costs (depending on treatment)
	Extraction and Ex-situ Treatment	Biological Treatment	Cometabolic Aerobic Biodegradation (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Requires large scale groundwater extraction and treatment system.	Would require construction of special treatment train, thus high capital costs. May require large amounts of chemicals, thus high O&M costs.
			Anaerobic Biodegradation (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Requires large scale groundwater extraction and treatment system.	Would require construction of special treatment train. High capital costs. Long-term moderate to high O&M costs.
		Chemical Treatment	Chemical Oxidation (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Requires large scale groundwater extraction and treatment system.	Moderate capital costs and short-term O&M costs.

TABLE 4-2
Evaluation of Process Options
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Media	General Response Action	Remedial Technology Type	Process Option	Effectiveness	Implementability	Cost
Off-Property Groundwater Plumes (continued)	Extraction and Ex-situ Treatment (continued)	Physical Treatment	Air Stripping	Achieves RA objectives	Easy to implement. Uses proven and readily available technology.	Moderate capital costs and moderate long-term O&M costs.
			Spray Evaporation (1) (2)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Requires large scale groundwater extraction and treatment system.	Moderate capital costs and moderate to high long-term O&M costs.
			Carbon Adsorption	Technology can be effectively used in point-of-entry treatment systems, can be used with other technologies to achieve RA objectives.	Affected residential or other private groundwater wells can be easily retrofitted with point-of-entry treatment systems.	Moderate capital costs for point-of-use treatment systems and moderate long-term O&M costs.
			Discharge to POTW (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives	Requires large scale groundwater extraction and treatment system. Sewerage district may not accept accept additional flow volume. May require new sewer mains and treatment plant expansion	High capital costs and moderate long-term O&M costs. Uncertain discharge fees with local sewerage district
			Reverse Osmosis (1) (2) (3)	*Doesn't prevent exposure to groundwater (through private* wells), thus not achieving all of RA objectives.	*Would require construction of complex treatment* system and large piping network between extraction wells. O&M activities would be extensive.	*High capital costs and high, long-term* O&M costs
	In-Situ Treatment	Biological Treatment	Enhanced Biodegradation (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Would require large-scale injection program to distribute enhancement chemicals throughout all of the off-property plumes.	High capital costs and high short-term O&M costs for monitoring and additional injections.
		Chemical Treatment	Chemical Oxidation (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Would require large-scale injection program to distribute enhancement chemicals throughout all of the off-property plumes.	High capital costs and high short-term O&M costs for monitoring and additional injections.
			Passive Treatment Wall (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Would require very long and deep trenching for wall and access agreements for this trenching on private property	Very high capital costs and moderate long-term O&M costs
		Physical Treatment	Air Sparging/Soil Vapor Extraction (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives	Would require extensive network of sparge/extraction piping. Would require access agreements for all of this piping on private property	Very high capital costs and high long-term O&M costs.
			Vacuum Vapor Extraction (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives.	Would require installation of numerous new specially equipped wells on private property, an extensive extraction pipe network, and access agreements for all of these.	High capital costs and high long-term O&M costs.
			Thermal Vapor Extraction (1) (2) (3)	Doesn't prevent exposure to groundwater (through private wells), thus not achieving all of RA objectives	Would require installation of numerous new extraction wells and heating points, extensive extraction pipe network, and access agreements for all of these.	High capital costs and high long-term O&M costs

LEGEND

(shaded box) Not carried forward

Notes:

(1) Not carried forward due to effectiveness limitations.
(2) Not carried forward due to implementability limitations.
(3) Not carried forward due to cost limitations.

LAS/las/mln/BAI/KJQ
N:\jobs\208\2402\01\wp\tbl\FS_TABLE 4-2 revised xls (Table 4-2)
2082402 01180101-MAD1

TABLE 5-1
Assembling Alternatives
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

					Groundwater Remedial Action Alternatives						
					1	2	2a	3	3a	4	4a
Media	General Response Action	Remedial Approach	Process Option	Area or Volume	No Action	On-Property Groundwater Pump & Treat and Off-property Groundwater Plume Exposure Control	On-Property Groundwater Pump & Treat and Off-Property Groundwater Pump & Treat	Groundwater VOC Source Treatment and Off-property Groundwater Plume Exposure Control	Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat	On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment & Off-Property Exposure Control	On-Property Groundwater Pump & Treat Groundwater VOC Source Treatment & Off-Property Groundwater Pump & Treat
Groundwater VOC Source Area	No Action	No Action	No Action	Entire NPL Site							
	Institutional Controls	Deed Restrictions	Groundwater Use Restrictions	Entire NPL Site							
	Monitoring	Monitoring	Groundwater Monitoring	Entire NPL Site							
	Gradient Control	Groundwater Containment	Groundwater Extraction	Downgradient NPL Groundwater Wells							
	Groundwater Extraction and Ex-Situ Treatment	Physical Treatment	Air Stripping	Extracted Groundwater							
	In-situ Groundwater Treatment	Biological Treatment	Enhanced Biodegradation	Groundwater Plume Source Area							
		Physical Treatment	Air Sparging/Soil Vapor Extraction	Groundwater Plume Source Area							
			Vacuum Vapor Extraction	Groundwater Plume Source Area							
		Chemical Treatment	Chemical Oxidation	Groundwater Plume Source Area							
On-Property Groundwater Plume	No Action	No Action	No Action	Entire NPL Site							
	Institutional Controls	Deed Restrictions	Groundwater Use Restrictions	Entire NPL Site							
	Monitoring	Monitoring	Groundwater Monitoring	Entire NPL Site							
	Gradient Control	Groundwater Containment	Groundwater Extraction	Downgradient NPL Groundwater Wells							
	Groundwater Extraction and Ex-Situ Treatment	Physical Treatment	Air Stripping	Extracted Groundwater							
Off-Property Groundwater Plumes	No Action	No Action	No Action	Off-Property Groundwater Plumes							
	Institutional Controls	Deed Restrictions	Groundwater Management Zone	Off-property Affected Private Residences/Wells							
		Water Supply Transfer	Connection to Municipal Water	Off-property Affected Private Wells		(1)	(1)	(1)	(1)	(1)	(1)
			Private Well Redrilling	Off-property Affected Private Wells		(1)	(1)	(1)	(1)	(1)	(1)
	Monitoring	Monitoring	Groundwater Monitoring	Off-property Groundwater							
	Extraction and Ex-Situ Treatment	Physical Treatment	Air Stripping	Off-property Groundwater							
			Carbon Absorption	Off-property Affected Private Wells		(1)	(1)	(1)	(1)	(1)	(1)

Notes:

1. Process Options remaining as a result of the Evaluation of Process Options in Table 2 are included as possible Process Options The actual Process Option selected will be determined during the Remedial Design.
2. For Alternatives 2, 3, and 4 the remedial approach for the off-property groundwater plume consists of exposure control through the establishment of a groundwater management zone with contingencies as necessary for minimizing exposure in present private wells.
3. For a detailed description of these alternatives, please refer to section 5.2 of the Alternatives Array document.
4. The groundwater control measures employed as part of Alternatives 2 and 4 for the On-Property Groundwater Plume may also potentially include the extension of the existing ISCA groundwater control and containment system into the Blackhawk Acres subdivision.

Denotes Remedial Technology is/may be included as an element of the alternative in some form.

Footnotes:
(1) Theses actions will be part of the specified alternatives only if COPCs attributable to the NPL site are detected above their MCLs in private wells. For the purposes of this FS it is assumed these wells will not be affected

LAS/las/BAI/KJQ
N:\jobs\208\2402\01\wp\tbl\FS_TABLE 5-1 revised.xls (Table 5-1)
2082402.01180101-MAD1

TABLE 6-1

Summary of Potential ARARs

Beloit Corporation, Rockton Facility
Rockton, Illinois

	ARARs	Description of Regulation	Applicability, Relevance, and Appropriateness to Beloit Corporation	Potential ARARs for Each Alternative						
				Alt 1	Alt 2	Alt 2a	Alt 3	Alt 3a	Alt 4	Alt 4a
	<u>Chemical Specific</u>									
	Federal									
1.	40 CFR 50 6 National Primary and Secondary Ambient Air Quality Standards for Particulate Matter	Defined as: (1) 150 micrograms per cubic meter, 24-hour concentration, (2) 50 micrograms per cubic meter, annual arithmetic mean, (3) particulate matter shall be measured as PM 20 (particulates with a diameter less than or equal to 10 micrometers).	Applies to alternatives that include construction and drilling.			X	X	X		X
2	40 CFR 53 Ambient Air Monitoring Reference and Equivalent Methods	Provides methods for monitoring conventional air pollutants in ambient air.	Applies to alternatives that include construction and drilling.			X	X	X		X
3.	40 CFR 63 National Emission Standards for Hazardous Air Pollutants For Affected Source Categories	Contains national emission standards for hazardous air pollutants (NESHAP) established pursuant to section 112 of the Clean Air Act Section includes TCE and PCE.	Applies to alternatives that include on-site treatment (air stripping) where NESHAP chemicals could be emitted.		X	X		X	X	X
4.	40 CFR 370 Hazardous Chemical Reporting: Community Right to Know	Establishes reporting requirements which provide the public with important information on the hazardous chemicals in their communities.	Not applicable because site will not meet requirments for the levels of hazardous waste, extremely hazardous, Tier II, or Form R.		X	X	X	X	X	X
5.	40 CFR 141 Federal Drinking Water Standards	Establishes MCLs and/or MCLGs for such things as inorganic and organic chemicals, turbidity, and microbial and radioactive contaminants.	Relevant and appropriate due to the private and public wells in the area.	X	X	X	X	X	X	X
6.	40 CFR 143 Secondary Drinking Water Regulations	Establishes secondary MCLs. -	Relevant and appropriate due to the private and public wells in the area.	X	X	X	X	X	X	X
7	40 CFR Part 61 National Emissions Standards for Hazardous Air Pollutants	Lists Perchloroethylene (50FR 52800, Dec. 26, 1985) and Trichloroethylene (50FR 52422, Dec 23, 1985) as other substances that are considered in being the cause of serious health effects.	Relevant and appropriate to all alternatives that includes air emissions of VOCs		X	X		X	X	X
	State									
1	IAC 35 Part 212 Visible and Particulate Matter Emissions	Contains standards and limitations for visible and particulate matter emissions from stationary emissions units.	Not applicable because emissions from stationary units is limited to the air stripping tower. Particulate emissions are not applicable to these units.			X	X	X		X
2.	IAC 35 Part 215 Organic Material Emissions Standards and Limitations	Contains standards and limitations for emissions of organic matter from stationary sources located outside of the Chicago area. Includes clean-up and disposal operations	Applies to treatment of the VOC in the groundwater where organic matter could be emitted (I.e. air stripping)		X	X		X	X	X
3	IAC 35 Part 620 Groundwater Quality	Prescribes various aspects of groundwater quality, including method of classification of groundwaters, nondegradation provisions, standards for quality of groundwaters, and various procedures and protocols for the management and protection of groundwaters	Relevant and appropriate to the classification and quality of groundwater on the site.	X	X	X	X	X	X	X

TABLE 6-1

Summary of Potential ARARs

Beloit Corporation, Rockton Facility
Rockton, Illinois

	ARARs	Description of Regulation	Applicability, Relevance, and Appropriateness to Beloit Corporation	Potential ARARs for Each Alternative: Alt 1	Alt 2	Alt 2a	Alt 3	Alt 3a	Alt 4	Alt 4a
4.	IAC 35 Part 302 Water Quality Standards - Subpart B General Use Water Quality Standards	Contains general use water quality standards which must be met in waters of the state for which there is no specific designation.	Relevant and appropriate for the Rock River. Applies to alternatives which include discharges of treated water into the Rock River.		X	X		X	X	X
5.	IAC 35 Part 232 Toxic Air Contaminants	Establishes a program to identify toxic air contaminants.	Relevant to alternatives using air stripping as a device for remediation, since regulations identifies TCE & PCE as toxic air contaminants		X	X		X	X	X
6.	IAC 35 Part 653.118 Protection of Community Water Supply Structures	Requires that public water supply must be free of contamination.	Relevant and appropriate to all alternatives due to the proximity of the public water supply for the city of Rockton, Illinois.	X	X	X	X	X	X	X
	Location-Specific									
	Federal									
1.	33 CFR 320 and 40 CFR 6 Protection of the Environment	Requires the protection of wetlands, floodplains, important farmlands, coastal zones, wild and scenic rivers, fish and wildlife, and endangered species.	Relevant due to the floodplain on the Beloit Corp property, not applicable since the contamination does not extend to this part of the property.							
2.	50 CFR 200, 402 Endangered Species Act of 1973 and Regulations	Requires actions to avoid jeopardizing the continued existence of threatened species or modification of their habitats.	Not applicable. According to the BIRA (2001) the quality of habitat is low and not unique in any way.							
3.	EO 11990 Protection of Wetlands	Requires wetlands protection.	Not applicable, wetlands are not present.							
4.	36 CFR 800 National Historic Preservation Act - Protection of Historic and Cultural Properties	Requires action to take into account effects on properties included in or eligible for the National Register of Historic Places and to minimize harm to National Historic Landmarks.	Not applicable, site is not a historic or cultural property.							
5.	Environmental Protection Act, Title IV, Section 14.1	Restricts the location of a public water supply. It can not be located within 400 feet of primary or secondary source of contamination in unconsolidated and unconfined sand and gravel formations.	Relevant and appropriate for all alternatives, contaminated layer consists of silty sand. However, is not applicable since closest public water supply is presently located over 1000 feet from the groundwater plume.	X	X	X	X	X	X	X
6.	U.S. Army Corps of Engineers Permit - Actions Impacting Wetlands	Wetland permits. Establishes application requirements for a wetlands permit.	Not applicable because the activities will not occur in a wetlands.							
	State									
1.	77 IAC 920.50 Illinois Water Well Construction Code - Location and 415 ILCS/5 - Title IV Public Water Supplies	Establishes that the installation of potable groundwater wells can not be within 200 feet of primary or secondary source of contamination for clay and loam soils, and not within 400 feet for more permeable formations.	Relevant and appropriate for all alternatives, contaminated layer consists of silty sand. However, is not applicable since closest public water supply is presently located over 1000 feet from the groundwater plume. Additionally, on-site Beloit Corp. water supply well is located approximately 400 feet upgradient of the VOC source area.	X	X	X	X	X	X	X

TABLE 6-1

Summary of Potential ARARs

Beloit Corporation, Rockton Facility
Rockton, Illinois

	ARARs	Description of Regulation	Applicability, Relevance, and Appropriateness to Beloit Corporation	Potential ARARs for Each Alternative: Alt 1	Alt 2	Alt 2a	Alt 3	Alt 3a	Alt 4	Alt 4a
	<u>Action-Specific</u>									
	Federal									
1	40 CFR 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System	Provides requirements for discharges into surface water associated with industrial facilities and construction projects.	Applies to alternatives which discharge treated water into the Rock River.		X	X		X	X	X
2.	40 CFR 122 41 EPA Administered Permit Programs, The National Pollutant Discharge Elimination System	Provides requirements for: (1) monitoring treatment system effluent, (2) compliance with additional substantive conditions, (3) compliance with Federally-approval State water quality standards, and (4) use of Best Available Technology (BAT).	Applies to alternatives which discharge treated water into the Rock River.		X	X		X	X	X
3.	40 CFR Subpart K Criteria and Standards for the NPDES	Requires that a Best Management Practices program be designed and implemented to prevent the release of toxic or hazardous pollutants to waters of the U.S.	Applies to alternatives which discharge treated water into the Rock River.		X	X		X	X	X
4.	40 CFR 129 Toxic Pollutant Effluent Standards.	Establishes effluent standards/prohibitions for toxic pollutants which may be incorporated into any NPDES permit.	Does not apply, TCE and PCE along with other contaminants found on site are not listed as toxic pollutants under this regulation.							
5.	40 CFR 136 Test Procedures for the Analysis of Pollutants	Provides detailed requirements for analytical procedures and quality controls.	Applicable to tests done under alternatives.		X	X	X	X	X	X
6.	40 CFR 262 Standards Applicable to Generators of Hazardous Waste	Hazardous waste generators must manage waste properly.	Applicable to alternatives that may produce hazardous waste. Examples may potentially include waste generated during driling or construction.		X	X	X	X	X	X
7.	40 CRR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	Establishes minimum national standards which define the acceptable management of hazardous waste.	Applies to alternatives if hazardous wastes are shipped off-site. The off-site facilities would have to meet these requirements.		X	X	X	X	X	X
8.	Clean Air Act Section 112 List of Source Categories and Hazardous Pollutants to be Regulated.	Lists source categories and 189 substances to be regulated by EPA as air toxics under Section 112.	Relevant to alternatives which include an air stripping treatment device which will create emissions regulated as air toxics.		X	X		X	X	X
9.	40 CFR 177 CERCLA Off-Site Disposal Regulation	Facilities where wastes are disposed must be in compliance with this policy.	Applicable to alternatives that may produce hazardous waste. Examples may potentially include waste generated during driling or construction.		X	X	X	X	X	X
10.	40 CFR 268 Land Disposal Restrictions	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed.	Applicable to alternatives that may produce hazardous waste. Examples may potentially include waste generated during driling or construction.		X	X	X	X	X	X
11.	40 CFR 52 Approval and Promulgation of Implementation Plans	Requires the design of a remediation system to provide odor-free operation.	Applies to alternatives that include the design of a remediation system.			X	X	X	X	X

TABLE 6-1

Summary of Potential ARARs

Beloit Corporation, Rockton Facility
Rockton, Illinois

	ARARs	Description of Regulation	Applicability, Relevance, and Appropriateness to Beloit Corporation	Potential ARARs for Each Alternative						
				Alt 1	Alt 2	Alt 2a	Alt 3	Alt 3a	Alt 4	Alt 4a
12.	40 CFR 58 Ambient Air Quality Surveillance	Establishes criteria and requirements for ambient air quality monitoring and requirements for reporting ambient air quality data and information.	Applies to owners and operators of proposed sources		X	X		X	X	X
13.	40 CFR Part 60 Standards of Performance for New Stationary Sources	Establishes standards for emissions performance of stationary sources	Applies to owners and operators of any alternative which includes any new stationary source which contains an affected facility		X	X		X	X	X
14.	American Council of Govenmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs)	Establishes safety standards for use in the construction industry.	May be applicable to those alternatives that involve construction.							
15.	29 CFR Part 1910 Occupational Safety and Health Act (OSHA) - General Industry Standards	Establishes general industry standards.	May be applicable at the site for those alternatives involving construction.							
16.	29 CFR Part 1926 OSHA Saftey and Health Standards for Construction	Establishes health and safety standards to be used in construction.	May be applicable at the site for those alternatives involving construction.							
	State									
1.	IAC 35 Part 703 RCRA Permit Program	Requires RCRA permits pursuant to Section 21(f) of the Environmental Protection Act, for hazardous waste management (HWM) facilities, which may include one or more treatment, storage, or disposal (TSD) units	Applies to alternatives if hazardous wastes are shipped off-site. The off-site facilities would have to meet these requirements. Example may be alternatives that include the activated carbon treatment at private wells, if the used activated carbon is determined to be a hazardous waste.		X	X	X	X	X	X
2	IAC 35 Air Pollution Part 201.142 Permits and General Provisions - Construction Permit Required	Requires a construction permit to be obtained from the Agency before any new emission source or air pollution control equipment, or modification of any existing emission source occur.	Applicable to alternatives that include the construction of a new air stripping treatment system.			X		X		X
3.	IAC 35 Part 740 Site Remediation Program	Establishes the procedures for the investigative and remedial activities at sites where there is a release, threatened release, or suspected release of hazardous substances, pesticides, or petroleum and for the review and approval of those activities.	Relevant and appropriate for the all alternatives, since it is a listed NPL site.	X	X	X	X	X	X	X
4.	IAC 35 Part 722 Standards Applicable to Generators of Hazardous Waste	Hazardous waste generators must manage waste properly.	Applicable to alternatives that may produce hazardous waste. Examples may potentially include waste generated during driling or construction.		X	X	X	X	X	X
5.	IAC 35 Part 724 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	Provides standards for owners and operators of all facilities that treat, store, or dispose of hazardous waste.	Applies to alternatives if hazardous wastes are shipped off-site. The off-site facilities would have to meet these requirements. Example may be alternatives that include the activated carbon treatment at private wells, if the used activated carbon is determined to be a hazardous waste.		X	X	X	X	X	X
6.	IAC 35 Part 309 Subpart A NPDES Permits	Provides instructions for NPDES permits for discharges into navigable waters of the state. Effluent limitations and monitring requirements are established during the permitting process.	Applicable for alternatives that include discharging into navigable surface water.							

TABLE 6-1

Summary of Potential ARARs

Beloit Corporation, Rockton Facility
Rockton, Illinois

	ARARs	Description of Regulation	Applicability, Relevance, and Appropriateness to Beloit Corporation	Potential ARARs for Each Alternative						
				Alt 1	Alt 2	Alt 2a	Alt 3	Alt 3a	Alt 4	Alt 4a
7	IAC 34 Part 304 Subpart A General Effluent Standards	Provides general limits for discharging to a surface water	Applicable for alternatives that include discharging into navigable surface water.							
8.	IAC 35 part 305.103 Effluent Measurement	Requires every effluent discharge sewers, pipes or outfalls to be designed so a sample of the effluent can be obtained at a point after the final treatment process and before discharge to or mixing with any waters of the state.	Applies to alternatives which include discharging treated groundwater into the Rock River.		X	X		X	X	X
9.	IAC 35 Part 305.102 Reporting Requirements	Requires every pretreatment works, treatment works or wastewater source to submit operating reports to the IEPA at a frequency determined by the IEPA.	Applies to alternatives which include treatment of the affected groundwater.		X	X	X	X	X	X
10.	IAC 29 Part 620 Emergency Planning and Community Right to Know	Establishes reporting procedures to ensure that the location and amount of hazardous chemicals in a facility is monitored and made available to the State Emergency Response Commission (SERC), the local planning committee, the local fire department and the public.	Not applicable because site will not meet requirments for the levels of hazardous waste, extremely hazardous, Tier II, or Form R.		X	X	X	X	X	X
11.	IAC 35 Part 742.1000 Institutional Controls	Establishes procedures and standards for implementing institutional controls on a property.	Applies to alternatives that include institutional controls, such as land use controls (i.e., deed restrictions, zoning controls, etc.) or odinances adopted by a unit of local government to restrict land use.		X (TBC)	X (TBC)	X (TBC)	X (TBC)	X (TBC)	X (TBC)
12.	77 Ill. Adm. Code 920 - Illinois Water Well Construction Code	Provides minimum standards for location, construction and modification of water wells, monitoring wells, and closed loop wells which are not otherwise subject to regulation under EPA, Title IV, Public Water Supplies (Ill. Rev. Stat. 1991, ch. 111 1-2, pars. 1014-1019)	Applies to the construction, modification or abandonment of monitoring/extraction wells. Applicable to alternatives that include the construction of MW extraction wells.			X		X		X
13.	415 ILCS/5 - Environmental Protection Act Title SVII Site Remediation Program	Establishes a risk-based system of remediation based on the protection of human health and the environment relative to present and future uses of the site	Applies to all alternatives.	X	X	X	X	X	X	X
14.	Illinois EPA Administrative Procedure #11: Monitor Well Design Criteria	Establishes criteria of monitoring well design to ensure consistency and integrity of groundwater samples.	Applicable to alternatives if construction, modification or installation of monitoring wells is required.	X	X	X	X	X	X	X
15.	U.S. EPA 540-R-98-016 "Close Out Procedures for National Priorities Lists Sites - January 2000.	Described key principles and expectations, interspersed with "best practices" based on program experience that should be consulted at the time to close out Superfund's National Priorities List Sites.	All alternatives.	X	X	X	X	X	X	X

Legend

(TBC) = *To-be-considered category of potential requirements that may apply to an alternative.*

LAS/las/BAI/KJQ
N:\jobs\208\2402\01\wp\tbl\FS_TABLE 6-1 revised.xls
2082402.01180101-MAD1

TABLE 6-2
Summary of Cost Estimates
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

	Alternative	Cost		
		Capital	Annual O&M	Net Present Worth
1	No Action [1]	$0	$0	$0
2	On-Property Groundwater Pump & Treat and Off-Property Groundwater Plumes Exposure Control[2]	$434,500	$87,000	$1,587,000
2a	On-Property Groundwater Pump & Treat and Off-Property Groundwater Pump & Treat[2]	$1,542,000	$165,000 - $202,000	$3,667,000
3	Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Controls	$698,000	$44,000 - $73,000	$1,222,000
3a	Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat	$1,790,000	$122,000 - $151,000	$3,140,000
4	On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Plumes Exposure Control[2]	$1,060,000	$87,000 - $125,000	$1,918,000
4a	On-Property Groundwater Pump and Treat, Groundwater VOC Source Treatment, and Off-Property Groundwater Pump and Treat[2]	$2,131,000	$165,000 - $202,000	$3,699,000

Notes:

1. Net Present Worth costs are based on a 30 year life of the project for Alternatives 2 and 2a, a 20-year life of the project for Alternatives 3 and 3a, and a 15-year life of the project for Alternatives 4 and 4a.
2. All costs are rounded to the nearest thousand dollars.
3. See Appendix A for details on the cost analysis of each alternative.
4. In the event that one of the private wells becomes affected by one of the VOC plumes, an additional assumed capital cost of $50,000 will be added for each well/residence that needs to be placed on municipal water. However, a decision on the course of action for each well/residence will be made on an individual basis, if necessary. Potential actions may include re-drilling the well to a deeper aquifer, connection of the residence to municipal water, or the installation of point-of-entry treatment. These costs are not included in these alternatives due to their uncertainty.
5. The annual O&M costs include a range to account for the various periodic costs, such as, 5-year review and maintenance costs that occur every few years.

Footnotes:

(1) For purposes of the FS the cost of the no action alternative is considered to be zero. However, there would be costs associated with this alternative, including the abandonment of wells and removal of current remediation systems.
(2) Includes costs for ISCA Extension into Blackhawk Acres Subdivision.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	**ALTERNATIVE 1** No Action – includes the discontinuation of the current remedial system	**ALTERNATIVE 2** On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 2A** On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	**ALTERNATIVE 3** Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 3A** Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	**ALTERNATIVE 4** On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 4A** On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
1. Overall Protection of Human Health and the Environment	○	●	●	●	●	●	●
a. How Alternative Provides Human Health & Environmental Protection	- The Groundwater poses a risk to potential receptors, because of the affected private wells and the because of the presence of Rockton's public water supply. - Contaminants of concern and exposure pathways discussed in the 2001 Baseline Risk Assessment (BIRA) remain unchanged. - Does not meet the groundwater quality objective outlined in Federal and State ARARs.	- The current pump and treat system installed for the on-property groundwater plume is doing an effective job of controlling the affected groundwater. - The point of entry treatment systems installed on the private wells are sufficient to provide protection to the residents. - Three private wells have had concentrations of PCE, which do not meet specified ARARs. - The off-property groundwater plumes will eventually discharge into the Rock River and will not likely affect the village of Rockton's water supply. The dilution effect of the Rock River will create a concentration that will likely not be of concern. - Exposure control of the off-property groundwater plumes should sufficiently protect residents from exposure.	- The current pump and treat system installed for the on-property groundwater plume is doing an effective job of controlling the affected groundwater. - The points of use systems installed on the private wells are sufficient to provide protection to the residents along with the treatment of the plume. - A pump and treat system for the off-property plume would reduce the plume size and concentration providing additional protection of the public water supply.	- A chemical oxidation treatment of the groundwater VOC source area would eliminate the continued release from the source and reduce the potential for VOCs affecting private wells. - The point of entry treatment systems installed on the private wells are sufficient to provide protection to the residents along with the treatment of the plume. - The off-property groundwater plumes will eventually discharge into the Rock River and will not likely affect the village of Rockton's water supply. The dilution effect of the Rock River will create concentrations that will not likely be of concern. - Exposure control of the off-property groundwater plumes should sufficiently protect residents from exposure.	- A chemical oxidation treatment of the groundwater VOC source area would eliminate the continued release from the source and reduce the potential for VOCs affecting private wells. - The point of entry treatment systems installed on the private wells are sufficient to provide protection to the residents along with the treatment of the plume. - A pump and treat system for the off-property plumes would reduce the plume size and concentration, providing additional protection of the public water supply.	- The current pump and treat system installed for the on-property groundwater plume is doing an effective job of controlling the affected groundwater. - A chemical oxidation treatment of the groundwater VOC source area would eliminate the continued release from the source and reduce the potential for VOCs affecting private wells. - The point of entry treatment systems installed on the private wells are sufficient to provide protection to the residents along with the treatment of the plume. - The off-property groundwater plumes will eventually discharge into the Rock River and will not likely affect the village of Rockton's water supply. The dilution effect of the Rock River will create concentrations that will not likely be of concern.- Exposure control of the off-property groundwater plumes should sufficiently protect residents from exposure.	- The current pump and treat system installed for the on-property groundwater plume is doing an effective job of controlling the affected groundwater. - A chemical oxidation treatment of the groundwater VOC source area would eliminate the continued release from the source and reduce the potential for VOCs affecting private wells. - The point of entry treatment systems installed on the private wells are sufficient to provide protection to the residents along with the treatment of the plume. - A pump and treat system for the off-property plume would reduce the plumes size and concentration, providing additional protection of the public water supply.
2. Compliance with ARARs	○	●	●	●	●	●	●
a. Compliance With Chemical-Specific ARARs	- Does not meet drinking water requirements due to affected private wells.	- Meets the requirements of the Federal and State chemical-specific ARARs as identified in Table 6-1.	- Meets the requirements of the Federal and State chemical-specific ARARs as identified in Table 6-1.	- Meets the requirements of the Federal and State chemical-specific ARARs as identified in Table 6-1.	- Meets the requirements of the Federal and State chemical-specific ARARs as identified in Table 6-1.	- Meets the requirements of the Federal and State chemical-specific ARARs as identified in Table 6-1.	- Meets the requirements of the Federal and State chemical-specific ARARs as identified in Table 6-1.
b. Compliance With Action–Specific ARARs	- No action-specific ARARs identified, because no action will occur.	- Meets the requirements of both the Federal and State action-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State action-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State action-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State action-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State action-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State action-specific ARARs as identified in Table 6-1.
c. Compliance With Location-Specific ARARs	- No location-specific ARARs identified.	- Meets the requirements of both the Federal and State location-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State location-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State location-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State location-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State location-specific ARARs as identified in Table 6-1.	- Meets the requirements of both the Federal and State location-specific ARARs as identified in Table 6-1.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	**ALTERNATIVE 1** No Action – includes the discontinuation of the current remedial system	**ALTERNATIVE 2** On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 2A** On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	**ALTERNATIVE 3** Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 3A** Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	**ALTERNATIVE 4** On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 4A** On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
d. Compliance With Other Criteria, Advisories, and Guidance	- Does not meet drinking water criteria due to affected private wells.	- Meets the requirements of both the Federal and State other criteria, advisories, and guidance, as identified in Table 6-1	- Meets the requirements of both the Federal and State other criteria, advisories, and guidance, as identified in Table 6-1	- Meets the requirements of both the Federal and State other criteria, advisories, and guidance, as identified in Table 6-1	- Meets the requirements of both the Federal and State other criteria, advisories, and guidance, as identified in Table 6-1	- Meets the requirements of both the Federal and State other criteria, advisories, and guidance, as identified in Table 6-1	- Meets the requirements of both the Federal and State other criteria, advisories, and guidance, as identified in Table 6-1
3. Long-Term Effectiveness and Permanence	○	⊙	⊙	●	●	●	●
a. Magnitude of Residual Risk	- Remaining risk will increase due to the removal of the current remedial systems and treatment. - Risks in the BIRA calculated risk with the assumption that a remediation system would not be in place.	- Remaining risk will stay consistent with what risk is currently associated with the site. - Continuation of quarterly monitoring and reports will be required to assess the effectiveness of treatment. - Affected groundwater from the off-property groundwater plumes not treated by this remedial activity will continue to move towards the Rock River and eventually discharge and become diluted to a point below the MCLs.	- Remaining risk will stay consistent with the risk associated with the on-property groundwater plume. - Remaining risk for the off-property groundwater plumes will decrease. - Continuation of monitoring and reporting will be required to assess the effectiveness of treatment.	- At the conclusion of these remedial activities, the groundwater concentrations will be reduced to below the MCLs for the on-property groundwater plume. - Affected groundwater not treated with the source treatment will disperse and concentrations will become diluted. - Continuation of monitoring and reporting will be required to assess the effectiveness of treatment. - Affected groundwater from the off-property groundwater plumes not treated by this remedial activity will continue to move towards the Rock River and eventually discharge and become diluted to a point below the MCLs.	- At the conclusion of these remedial activities, the groundwater concentrations will be reduced to below the MCLs for the on-property groundwater plume and off-property groundwater plumes. - Affected groundwater from the on-property groundwater plume not treated by this remedial activity will disperse and concentrations will become diluted. - Continuation of monitoring and reporting will be required to assess the effectiveness of treatment.	- At the conclusion of these remedial activities, the groundwater concentrations will be reduced to below the MCLs for the on-property groundwater plume. - Affected groundwater from the off-property groundwater plumes not treated by this remedial activity will continue to move towards the Rock River and eventually discharge and become diluted to a point below the MCLs. - Continuation of monitoring and reporting will be required to assess the effectiveness of treatment.	- At the conclusion of these remedial activities, the groundwater concentrations will be reduced to below the MCLs for the on-property groundwater plume and off-property groundwater plumes. - Continuation of monitoring and reporting will be required to assess the effectiveness of treatment.
b. Adequacy and Reliability of Controls	- No action will not meet the Remedial Action Objectives.	- Long-term monitoring of the on and off-property groundwater plumes will be required until the contaminant levels fall below the established MCLs. The wells used for monitoring may have to be redeveloped, abandoned, or additional wells installed. The risks associated with these activities are considered low. - Operation and maintenance activities will continue as they currently are and may require repair of wells or the extraction and air stripping system. Risks associated with this activity are considered low.	- Long-term monitoring of the on and off-property groundwater plumes will be required until the contaminant levels fall below the established MCLs. The wells used for monitoring may have to be redeveloped, abandoned, or additional wells installed. The risks associated with these activities are considered low. - Operation and maintenance activities will continue as they currently are and may require repair of wells or the extraction and air stripping system. Risks associated with this activity are considered low.	- Long-term monitoring of the on and off-property groundwater plumes will be required until the contaminant levels fall below the established MCLs. The wells used for monitoring may have to be redeveloped, abandoned, or additional wells installed. The risks associated with these activities are considered low. - Operation and maintenance activities may require repair of wells and the chemical injection system. Risks associated with this activity are considered low.	- Long-term monitoring of the on- and off-property groundwater plumes will be required until the contaminant levels fall below the established MCLs. The wells used for monitoring may have to be redeveloped, abandoned, or additional wells installed. The risks associated with these activities are considered low. - Operation and maintenance activities may require repair of wells and the chemical injection system .	- Long-term monitoring of the on groundwater plumes will be required until the contaminant levels fall below the established MCLs. The wells used for monitoring may have to be redeveloped, abandoned, or additional wells installed. The risks associated with these activities are considered low. - Long-term monitoring of the off-property groundwater plumes will be required because the plume will remain in its current condition, until the plume has completely discharged into the Rock River.	- Long-term monitoring of the on groundwater plumes will be required until the contaminant levels fall below the established MCLs. The wells used for monitoring may have to be redeveloped, abandoned, or additional wells installed. The risks associated with these activities are considered low. - Operation and maintenance activities may require repair of wells and the chemical injection system.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
		- The uncertainties associated with the disposal of the residuals from the activated carbon treatment of the private wells are considered low. - Technology associated with this alternative has been well tested and is considered a reliable means of remediation.	- The uncertainties associated with the disposal of the residuals from the activated carbon treatment of the private wells are considered low. - Technology associated with this alternative has been well tested and is considered a reliable means of remediation. - Construction of the additional pump and treat system will create risk for construction workers associated with the railroad and vehicle traffic.	- The uncertainties associated with the disposal of the residuals from the activated carbon treatment of the private wells are considered low. - Technology associated with this alternative has been well tested and is considered a reliable means of remediation.	- Operation and maintenance activities may require repair of wells and the extraction and air stripping system. Risks associated with this activity are considered low. - The uncertainties associated with the disposal of the residuals from the activated carbon treatment of the private wells are considered low. - Technology associated with this alternative has been well tested and is considered a reliable means of remediation. - Construction of the additional pump and treat system will create risk for construction workers associated with the railroad and vehicle traffic.	- Operation and maintenance activities may require repair of wells and the chemical injection system. - The uncertainties associated with the disposal of the residuals from the activated carbon treatment of the private wells are considered low. - Technology associated with this alternative has been well tested and is considered a reliable means of remediation.	- Long-term monitoring of the off-groundwater plumes will be required until the contaminant levels fall below the established MCLs. - Operation and maintenance activities may require repair of wells and the extraction and air stripping systems. - The uncertainties associated with the disposal of the residuals from the activated carbon treatment of private wells are considered low. - Technology associated with this alternative has been well tested and is considered a reliable means of remediation. - Construction of the additional pump and treat system will create risk for construction workers associated with the railroad and vehicle traffic.
4. Reduction of Toxicity, Mobility, or Volume Through Treatment	○	⊙	⊙	⊙	⊙	●	●
a. Treatment Process and Remedy	- No action will not address the principle concern of VOCs in the groundwater.	- This alternative relies on treatment to achieve the remedial objectives. - The extraction and air stripping of water from the on-property groundwater plume is reducing the levels of VOCs in the groundwater. - Some reduction of VOCs levels may occur in the off-property plume through treatment of the on-property plume. - The groundwater VOC source will slowly be reduced through this option.	- This alternative relies on treatment to achieve the remedial objectives. - The extraction and air stripping of water from the on-property groundwater plume is reducing the levels of VOCs in the groundwater. - The extraction and air stripping of water from the off-property groundwater plumes will reduce the level of VOCs in the groundwater. - The groundwater VOC source will slowly be reduced through this option.	- This alternative relies on treatment to achieve the remedial objectives. - Chemical oxidation of water from the groundwater VOC source will reduce the levels of VOCs at the source. - Reductions in the VOC concentrations in the off-property plume would be expected to dissipate following the removal of the continuing source of VOCs to this groundwater.	- This alternative relies on treatment to achieve the remedial objectives. - Chemical oxidation of water from the groundwater VOC source will reduce the levels of VOCs at the source. - The extraction and air stripping of water from the off-property groundwater plumes will reduce the level of VOCs in the groundwater.	- This alternative relies on treatment to achieve the remedial objectives. - Chemical oxidation of water from the groundwater VOC source will reduce the levels of VOCs at the source. - Reductions in the VOC concentrations in the off-property plume would be expected to dissipate following the removal of the continuing source of VOCs to this groundwater. - The extraction and air stripping of water from the on-property groundwater plume is reducing the levels of VOCs in this groundwater.	- This alternative relies on treatment to achieve the remedial objectives. - Chemical oxidation of water from the groundwater VOC source will reduce the levels of VOCs at the source. - The extraction and air stripping of water from the off-property groundwater plumes will reduce the level of VOCs in the groundwater. - The extraction and air stripping of water from the on-property groundwater plume is reducing the levels of VOCs in the groundwater.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
b. Amount of Hazardous Material Destroyed or Treated	- No action will not destroy or treat any amount of hazardous material.	- The extraction and air stripping of groundwater from the on-property plume has removed approximately 280 pounds of VOCs from the summer of 1996 to the winter of 2001. - No removal of VOCs in the off-property plume will occur through treatment. - The groundwater VOC source VOCs levels will not be significantly reduced through this option.	- The extraction and air stripping of groundwater from the on-property plume has removed approximately 280 pounds of VOCs from the summer of 1996 to the winter of 2001. - Similar removal of VOCs could be expected of the extraction and air stripping unit for the off-site groundwater plume. - The groundwater VOC source VOCs levels will not be significantly reduced through this option.	- Chemical oxidation of the groundwater source area will remove the source of the VOCs for the on-property groundwater plume. - Groundwater that has already migrated outside of the source area will not be treated. - No removal of VOCs in the off-property plume will occur through treatment.	- Chemical oxidation of the groundwater source area will remove the source of the VOCs for the on-property groundwater plume. - Groundwater that has already migrated outside of the source area will be captured and treated via the Off-Property Pump and Treat system. - Removal of VOCs similar to the current extraction and air stripping system for the on-property groundwater plume could be expected of the extraction and air stripping unit for the off-site groundwater plume.	- Chemical oxidation of the groundwater source area will remove the source of the VOCs for the on-property groundwater plume. - No removal of VOCs in the off-property plume will occur through treatment. - The extraction and air stripping of groundwater from the on-property plume has removed approximately 280 pounds of VOCs from the summer of 1996 to the winter of 2001.	- Chemical oxidation of the groundwater source area will remove the source of the VOCs for the on-property groundwater plume. - The extraction and air stripping of groundwater from the on-property plume has removed approximately 280 pounds of VOCs from the summer of 1996 to the winter of 2001. - Removal of VOCs similar to the current extraction and air stripping system for the on-property groundwater plume could be expected of the extraction and air stripping unit for the off-site groundwater plume.
c. Reduction in Toxicity, Mobility, or Volume through Treatment	- No action will not reduce the toxicity, mobility or volume except through dilution.	- The extraction and air stripping of the on-property groundwater plume has restricted the mobility of the plume, but it has not significantly reduced the volume or the concentration of the source. - Reduction of toxicity, mobility, and volume will not occur for the off-property groundwater plume until it discharges to the Rock River, where it will volatilize to the air..	- The extraction and air stripping of the on-property groundwater plume and off-property groundwater plumes should restrict the mobility of these plumes. - Reduction of toxicity, mobility, or volume will be similar for the extraction and air stripping of the on-property groundwater plume as compared to the off-property groundwater plumes. The combination of these two treatment systems will slowly reduce the toxicity and volume of VOCs in the groundwater.	- The treatment of the groundwater VOC source should reduce the toxicity and mass of the source. - The treatment of the groundwater VOC source area alone will not significantly reduce the mobility or volume of the rest of the on-property plume. - Reduction of toxicity, mobility, and volume will not occur for the off-property groundwater plumes until it discharges to the Rock River, where it will volatilize to the air. Removal of the VOC source will cause the slow remediation of the off-property groundwater plumes through natural attenuation.	- The treatment of the groundwater VOC source should reduce the toxicity and mass of the source. - The treatment of the groundwater VOC source area alone will not significantly reduce the mobility or volume of the rest of the on-property plume. - The extraction and air stripping of the off-property groundwater plumes should restrict the mobility of the plume.	- The treatment of the groundwater VOC source should reduce the toxicity and mass of the source. - The extraction and air stripping of the on-property groundwater plume has restricted the mobility of the plume, but it has not significantly reduced the volume or the concentration of the source. - Reduction of toxicity, mobility, and volume will not occur for the off-property groundwater plumes. Removal of the VOC source will cause the slow remediation of the off-property groundwater plumes through natural attenuation.	- The treatment of the groundwater VOC source should reduce the toxicity and mass of the source. - The extraction and air stripping of the on-property groundwater plume has restricted the mobility of the plume, but it has not significantly reduced the volume or the concentration of the source. - The extraction and air stripping of the off-property groundwater plumes should restrict the mobility of the plume.
d. Irreversibility of the Treatment	- No action will be reversible.	- The extraction and air stripping treatment process of the on-property groundwater plume will be an irreversible process. - Exposure control measures place on the site will be a reversible process.	- The extraction and air stripping treatment process of the on-property groundwater plume will be an irreversible process. - The extraction and air stripping treatment process of the off-property groundwater plumes will be an irreversible process.	- The chemical oxidation treatment process of the groundwater VOC source area will be an irreversible process. - Exposure control measures place on the site will be a reversible process.	- The chemical oxidation treatment process of the groundwater VOC source area will be an irreversible process. - The extraction and air stripping treatment process of the off-property groundwater plumes will be an irreversible process.	- The chemical oxidation treatment process of the groundwater VOC source area will be an irreversible process. - The extraction and air stripping treatment process of the on-property groundwater plume will be an irreversible process.	- The chemical oxidation treatment process of the groundwater VOC source area will be an irreversible process. - The extraction and air stripping treatment process of the on-property groundwater plume will be an irreversible process.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	**ALTERNATIVE 1** No Action – includes the discontinuation of the current remedial system	**ALTERNATIVE 2** On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 2A** On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	**ALTERNATIVE 3** Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 3A** Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	**ALTERNATIVE 4** On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	**ALTERNATIVE 4A** On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
		- The use of point of entry treatment for the private wells is a reversible process. Connection of these wells to the municipal water supply is not a reversible process. Redrilling of these wells to a deeper, clean aquifer is not a reversible process.	- The use of point of entry treatment for the private wells is a reversible process. Connection of these wells to the municipal water supply is not a reversible process. Redrilling of these wells to a deeper, clean aquifer is not a reversible process. - The extraction and air stripping treatment process of the off-property groundwater plumes will be an irreversible process.	- The installation of the point of entry treatment for the private wells is a reversible process. Connection of these wells to the municipal water supply is not a reversible process. Redrilling of these wells to a deeper, clean aquifer is not a reversible process.	- The use of point of entry treatment for the private wells is a reversible process. Connection of these wells to the municipal water supply is not a reversible process. Redrilling of these wells to a deeper, clean aquifer is not a reversible process. - The extraction and air stripping treatment process of the off-property groundwater plumes will be an irreversible process.	- The use of point of entry treatment for the private wells is a reversible process. Connection of these wells to the municipal water supply is not a reversible process. Redrilling of these wells to a deeper, clean aquifer is not a reversible process. - Exposure control measures placed on the site will be a reversible process.	- The use of point of entry treatment for the private wells is a reversible process. Connection of these wells to the municipal water supply is not a reversible process. Redrilling of these wells to a deeper, clean aquifer is not a reversible process. - The extraction and air stripping treatment process of the off-property groundwater plumes will be an irreversible process.
e. Type and Quantity of Treatment Residual	- No action will not result in treatment residuals because no treatment of the VOCs will occur.	- The extraction and air stripping treatment will result in VOC emissions. - Exposure control measures will not result in any treatment residuals. - Residuals from any well drilling or piping trenches will be managed according to the applicable regulations. These materials are not anticipated to be classified as hazardous wastes.	- The extraction and air stripping treatment will result in VOC emissions. - Residuals from any well drilling or piping trenches will be managed according to the applicable regulations. These materials are not anticipated to be classified as hazardous wastes.	- The chemical oxidation will not result in any treatment residuals. - Exposure control measures will not result in any treatment residuals. - Residuals from any well drilling or piping trenches will be managed according to the applicable regulations. These materials are not anticipated to be classified as hazardous wastes.	- The chemical oxidation will not result in any treatment residuals. - The extraction and air stripping treatment will result in VOC emissions. - Residuals from any well drilling or piping trenches will be managed according to the applicable regulations. These materials are not anticipated to be classified as hazardous wastes.	- The chemical oxidation will not result in any treatment residuals. - The extraction and air stripping treatment will result in VOC emissions. - Exposure control measures will not result in any treatment residuals. - Residuals from any well drilling or piping trenches will be managed according to the applicable regulations. These materials are not anticipated to be classified as hazardous wastes.	- The chemical oxidation will not result in any treatment residuals. - The extraction and air stripping treatment will result in VOC emissions. - Residuals from any well drilling or piping trenches will be managed according to the applicable regulations. These materials are not anticipated to be classified as hazardous wastes.
f. Statutory Preference for Treatment as a Principal Element	- The inherent hazards at the Beloit Corporation NPL Site will not be reduced, they will remain at their current condition.	- The inherent hazards for the on-property groundwater plume are being reduced by treatment. - The inherent hazards for the off-property groundwater plumes will not be reduced by direct treatment, they will remain similar to the current conditions.	- The inherent hazards for the on-property groundwater plume are being reduced by treatment. - The inherent hazards for the off-property groundwater plumes will be reduced by treatment.	- The inherent hazards for the groundwater VOC source would be reduced by the treatment of the VOCs. - The inherent hazards for the off-property groundwater plumes will not be reduced by direct treatment, they will remain similar to the current condition.	- The inherent hazards for the groundwater VOC source would be reduced by the treatment of the VOCs. - The inherent hazards for the off-property groundwater plumes will be reduced by treatment.	- The inherent hazards for the on-property groundwater plume are being reduced by treatment. - The inherent hazards for the groundwater VOC source would be reduced by the treatment of the VOCs. - The inherent hazards for the off-property groundwater plumes will not be reduced by direct treatment, they will remain similar to the current condition.	- The inherent hazards for the on-property groundwater plume are being reduced by treatment. - The inherent hazards for the groundwater VOC source would be reduced by the treatment of the VOCs. - The inherent hazards for the off-property groundwater plumes will be controlled by treatment but not reduced.
5. Short-Term Effectiveness	○	●	●	●	●	●	●
a. Protection of Community During Remedial Actions	- Current risks will remain as described in the 2001 BIRA. The risk will increase from current conditions to those with affected private wells.	- Risks will remain similar to current conditions.	- Risks from the on-property groundwater plume will remain similar to current conditions.	- Risks from the on-property groundwater plume will be reduced.	- Risks from the on-property groundwater plume will be reduced.	- Risks from the on-property groundwater plume will be reduced.	- Risks from the on-property groundwater plume will be reduced.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
		- Currently the community is protected as affected wells have point-of-entry treatment.	- Currently the community is protected as affected wells have point-of-entry treatment. - Risks to the Rockton water supply will be reduced.	- Currently the community is protected as affected wells have point-of-entry treatment. - Risks for the off-property groundwater plumes will remain the same.	- Currently the community is protected as affected wells have point-of-entry treatment. - Risks to the Rockton water supply will be reduced.	- Currently the community is protected as affected wells have point-of-entry treatment. - Risks for the off-property groundwater plumes will remain the same.	- Currently the community is protected as affected wells have point-of-entry treatment. - Risks to the Rockton water supply will be reduced.
b. Protection of Workers During Remedial Actions	- Workers will be exposed to minimal risk with the removal of the current systems.	- Workers will have minimal risk. Only needed for monitoring, maintenance and operation of current system. - Workers are not needed for the implementation of an exposure control system.	- Workers may be exposed to hazardous constituents with the installation of an extraction and air stripping system for the off-property groundwater plumes. These risks can be managed through use of personnel protective equipment. - Workers will have minimal risk. Only needed for monitoring, maintenance and operation of current extraction and air stripping system for on-property groundwater plume. - Workers will have risk associated with the construction of the new pump and treat for the off-property groundwater plumes due to the proximity of the railroad and vehicle traffic.	- Workers may be exposed to hazardous constituents with the installation of the chemical oxidation treatment system for the groundwater VOC source area. These risks can be managed through use of personnel protective equipment. However, risks to workers are greater than compared to alternatives that do not involve chemical oxidation. - Workers will be exposed to minimal risk with the removal of the current systems. - Workers are not needed for the implementation of an exposure control system.	- Workers may be exposed to hazardous constituents with the installation of the chemical oxidation treatment system for the groundwater VOC source area. These risks can be managed through use of personnel protective equipment. However, risks to workers are greater than compared to alternatives that do not involve chemical oxidation. - Workers will be exposed to minimal risk with the removal of the current systems. - Workers may be exposed to hazardous constituents with the installation of an extraction and air stripping system for the off-property groundwater plumes. These risks can be managed through use of personnel protective equipment. - Workers will have risk associated with the construction of the new pump and treat for the off-property groundwater plumes due to the proximity of the railroad and vehicle traffic.	- Workers will have minimal risk. Only needed for monitoring, maintenance and operation of current system. - Workers are not needed for the implementation of an exposure control system. - Workers may be exposed to hazardous constituents with the installation of the chemical oxidation treatment system for the groundwater VOC source area. These risks can be managed through use of personnel protective equipment. However, risks to workers are greater than compared to alternatives that do not involve chemical oxidation.	- Workers may be exposed to hazardous constituents with the installation of an extraction and air stripping system for the off-property groundwater plumes. These risks can be managed through use of personnel protective equipment. - Workers will have minimal risk. Only needed for monitoring, maintenance and operation of current extraction and air stripping system for on-property groundwater plume. - Workers may be exposed to hazardous constituents with the installation of the chemical oxidation treatment system for the groundwater VOC source area. These risks can be managed through use of personnel protective equipment. However, risks to workers are greater than compared to alternatives that do not involve chemical oxidation. - Workers will have risk associated with the construction of the new pump and treat for the off-property groundwater plumes due to the proximity of the railroad and vehicle traffic.
c. Environmental Impacts	- Present potential ecological risks described in the BIRA will remain.	- Environmental impacts will remain the same as current conditions. - Risk to the Rock River is minimal due to the large dilution factor that will occur as the off-property groundwater plumes discharge into the river.	- Environmental impacts will remain the same as current conditions for the on-property groundwater plume. - Risk to the Rock River will be reduced with the installation of the extraction and air stripping system for the off-property groundwater plumes.	- Environmental impacts of the on-property groundwater plume will be reduced with the treatment of the source area. - Risk to the Rock River is minimal due to the large dilution factor that will occur as the off-property groundwater plumes discharge into the river.	- Environmental impacts of the on-property groundwater plume will be reduced with the treatment of the source area. - Risk to the Rock River will be reduced with the installation of the extraction and air stripping system for the off-property groundwater plumes.	- Risk to the Rock River is minimal due to the large dilution factor that will occur as the off-property groundwater plumes discharge into the river. - Environmental impacts of the on-property groundwater plume will be reduced with the treatment of the source area.	- Risk to the Rock River will be reduced with the installation of the extraction and air stripping system for the off-property groundwater plumes. - Environmental impacts of the on-property groundwater plume will be reduced with the treatment of the source area.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
d. Time Until Remedial Action Objectives Are Achieved	- Remedial objectives will not be achieved.	- The remedial objectives will be achieved in the long term as the source area is slowly remediated through the on-property extraction system. - The anticipated remedial time frame for this alternative is 30 years.	- The remedial objectives will be achieved in the long term as the source area is slowly remediated through the on-property extraction system. - The anticipated remedial time frame for this alternative is 30 years.	- The remedial objectives will be achieved for the on-property groundwater plume sooner than alternatives that do not include treatment of the source area. - The anticipated remedial time frame for this alternative is 20 years.	- The remedial objectives will be achieved for the on-property groundwater plume sooner than alternatives that do not include treatment of the source area. - The anticipated remedial time frame for this alternative is less than 20 years.	- The remedial objectives will be achieved for the on-property groundwater plume sooner than alternatives that do not include treatment of the source area. - The anticipated remedial time frame for this alternative is 15 years.	- The remedial objectives will be achieved for the on-property groundwater plume sooner than alternatives that do not include treatment of the source area. - The anticipated remedial time frame for this alternative is 15 years.
		- Monitoring will be required to determine when remedial objectives will be achieved.	- Monitoring will be required to determine when remedial objectives will be achieved.	- The remedial objectives will be achieved over the long-term as the plume disperses and discharges to the Rock River.	- The remedial objectives will be achieved for the off-property groundwater plumes in the long term as VOCs migrate from the on-property plum and are extracted and treated in the off-property extraction and treatment system. Monitoring will be required to determine when remedial objectives will be achieved.	- The remedial objectives will be achieved over the long-term as the plume disperses and discharges to the Rock River. The time frame will be shorter than for Alternatives 3 and 3a because the source is removed and on-property groundwater extraction will more quickly achieve remediation objectives on property.	- The remedial objectives will be achieved for the off-property groundwater plumes over a similar time frame as Alternative 4. Monitoring will be required to determine when remedial objectives will be achieved.
6. Implementability	●	●	●	●	●	●	●
a. Technical Feasibility							
i. Ability to Construct and Operate the Technology	- The removal of the current system will not cause any foreseen difficulties.	- The ability to operate the technology for this alternative is already in place. - The ability to implement exposure controls exists.	- The ability to construct and operate the technology for this alternative is already in place. - The construction of the off-property groundwater plumes pump and treat system would be difficult due to coordination with Railroad, water, street, sewer and other utilities and the presence of six road crossings.	- The ability to construct and operate this chemical oxidation alternative would be moderately difficult due to the location of the groundwater VOC source being under an existing building footprint. - The discontinuation of the current extraction and air stripping system is not anticipated to be difficult. - The ability to implement exposure controls exists.	- The ability to construct and operate this chemical oxidation alternative would be moderately difficult due to the location of the groundwater VOC source being under an existing building footprint. - The ability to construct and operate the technology for this alternative is already in place. - The discontinuation of the current extraction and air stripping system is not anticipated to be difficult. - The construction of the off-property groundwater plumes pump and treat system would be difficult due to coordination with Railroad, water, street, sewer and other utilities and the presence of six road crossings.	- The ability to construct and operate this chemical oxidation alternative would be moderately difficult due to the location of the groundwater VOC source being under an existing building footprint. - The ability to construct and operate the technology for this alternative is already in place. - The ability to implement exposure controls exists.	- The ability to construct and operate this chemical oxidation alternative would be moderately difficult due to the location of the groundwater VOC source being under an existing building footprint. - The ability to construct and operate the technology for this alternative is already in place. - The construction of the off-property groundwater plumes pump and treat system would be difficult due to coordination with Railroad, water, street, sewer and other utilities and the presence of six road crossings.
ii. Reliability of the Technology	- Not applicable	- Technology has been proven to be reliable	- Technology has been proven to be reliable	- Technology has been proven to be reliable	- Technology has been proven to be reliable	- Technology has been proven to be reliable	- Technology has been proven to be reliable

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
iii. Ease of Undertaking Additional Remedial Actions, If Necessary	- Easy to implement additional remedial actions, if necessary, because no action will initially occur.	- Easy to implement additional remedial actions if determined necessary.	- Easy to implement additional remedial actions if determined necessary.	- Easy to implement additional remedial actions if determined necessary.	- Easy to implement additional remedial actions if determined necessary.	- No additional remedial actions are anticipated.	- No additional remedial actions are anticipated.
iv. Ability to Monitor Effectiveness of Remedy	- Easy to monitor the effectiveness of the remedy, because no action will occur	- The effectiveness of this alternative can be evaluated through monitoring of the VOCs levels in the groundwater until remedial objectives are met for the on-property groundwater plume. - Long term monitoring of the groundwater will be needed for the off-property groundwater plumes to monitor VOCs levels..	- The effectiveness of this alternative can be evaluated through monitoring of the VOCs levels in the groundwater until remedial objectives are met for the on-property groundwater plume. - Long term monitoring of the groundwater will be needed for the off-property groundwater plumes to monitor VOCs levels.	- The effectiveness of this alternative can be evaluated through monitoring of the VOCs levels in then groundwater until remedial objectives are met for the on-property groundwater plume. - Long term monitoring of the groundwater will be needed for the off-property groundwater plumes to monitor VOCs levels.	- The effectiveness of this alternative can be evaluated through monitoring of the VOCs levels in the groundwater until remedial objectives are met for the on-property groundwater plume. - Long term monitoring of the groundwater will be needed for the off-property groundwater plumes to monitor VOCs levels.	- The effectiveness of this alternative can be evaluated through monitoring of the VOCs levels in the groundwater until remedial objectives are met for the on-property groundwater plume. - Long term monitoring of the groundwater will be needed for the off-property groundwater plumes to monitor VOCs levels.	- The effectiveness of this alternative can be evaluated through monitoring of the VOCs levels in the groundwater until remedial objectives are met for the on-property groundwater plume. - Long term monitoring of the groundwater will be needed for the off-property groundwater plumes to monitor VOCs levels.
b. Administrative Feasibility							
i. Coordination With Other Agencies	- Approvals to discontinue current remediation activities will be required.	- No additional approvals would be necessary for the on-property groundwater plume since this alternative is already in place, since this alternative is already in place. However, the existing NPDES permit will need to be revised or a new permit would need to be issued. - Coordination the local municipalities would be needed to implement exposure controls.	- Construction permits, additional NPDES permits, and approval from the IEPA would be necessary to implement the extraction and air stripping system for the off-property groundwater plumes. - Coordination with the railroad for right of way access and with the local utilities for road crossings and underground utilities.	- Approval from the IEPA would be necessary to implement the chemical oxidation system - Coordination the local municipalities would be needed to implement exposure controls.	- Approval from the IEPA would be necessary to implement the chemical oxidation system - Construction permits, additional NPDES permits, and approval from the IEPA would be necessary to implement the extraction and air stripping system for the off-property groundwater plumes. - Coordination with the railroad for right of way access and with the local utilities for road crossings and underground utilities.	- Approval from the IEPA would be necessary to implement the chemical oxidation system - Coordination the local municipalities would be needed to implement exposure controls. - No additional approvals would be required for the extraction and air stripping system treating the on-property groundwater plume, since this alternative is already in place. However, the existing NPDES permit will need to be revised or a new permit would need to be issued.	- Approval from the IEPA would be necessary to implement the chemical oxidation system - Construction permits, additional NPDES permits, and approval from the IEPA would be necessary to implement the extraction and air stripping system for the off-property groundwater plumes. - No additional approvals would be required for the extraction and air stripping system treating the on-property groundwater plume, since this alternative is already in place. However, the existing NPDES permit will need to be revised or a new permit would need to be issued. - Coordination with the railroad for right of way access and with the local utilities for road crossings and underground utilities.
c. Availability of Services and Materials							
i. Availability of Off-Site Treatment, Storage, and Disposal Services and Capacity	- There is sufficient availability for disposal of the current remedial activities. - No off site treatment would be necessary.	- No off-site treatment or storage will be needed for the on-property plume, because the remedial action will take place on the Beloit Corporation property.	- No off-site treatment or storage will be needed for the on-property plume, because the remedial action will take place on the Beloit Corporation property.	- No off-site treatment or storage will be needed for the on-property plume, because the remedial action will take place on the Beloit Corporation property.	- No off-site treatment or storage will be needed for the on-property plume, because the remedial action will take place on the Beloit Corporation property.	- No off-site treatment or storage will be needed for the on-property plume, because the remedial action will take place on the Beloit Corporation property.	- No off-site treatment or storage will be needed for the on-property plume, because the remedial action will take place on the Beloit Corporation property.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
		- Disposal of used carbon from the activated carbon treatment of private wells depends on the classification of the waste. However, these services are readily available.	- Disposal of used carbon from the activated carbon treatment of private wells depends on the classification of the waste. However, these services are readily available.	- Disposal of used carbon from the activated carbon treatment of private wells depends on the classification of the waste. However, these services are readily available.	- Disposal of used carbon from the activated carbon treatment of private wells depends on the classification of the waste. However, these services are readily available.	- Disposal of used carbon from the activated carbon treatment of private wells depends on the classification of the waste. However, these services are readily available.	- Disposal of used carbon from the activated carbon treatment of private wells depends on the classification of the waste. However, these services are readily available.
ii. Availability of Necessary Equipment and Specialists	- Equipment and specialists for the removal of current remedial systems are readily available.	- No additional equipment or specialists are needed for this alternative.	- Equipment and specialists for the installation of an additional extraction and air stripping remedial system are readily available.	- Special equipment and specialists for the chemical oxidation of the groundwater VOC source area will be needed. However, these services are available. - Equipment and specialists for the off-property exposure control are readily available.	- Special equipment and specialists for the chemical oxidation of the groundwater VOC source area will be needed. However, these services are available. - Equipment and specialists for the installation of an additional extraction and air stripping remedial system are readily available.	- Special equipment and specialists for the chemical oxidation of the groundwater VOC source area will be needed. However, these services are available. - No additional equipment or specialists are needed for the on-property groundwater plume treatment. - Equipment and specialists for the off-property exposure control are readily available.	- Special equipment and specialists for the chemical oxidation of the groundwater VOC source area will be needed. However, these services are available. - Equipment and specialists for the installation of an additional extraction and air stripping remedial system are readily available. - No additional equipment or specialists are needed for the on-property groundwater plume treatment.
iii. Availability of Prospective Technologies	- Not applicable.	- No additional technology needed for this alternative.	- Air stripping installation and operation is a readily available technology.	- Chemical oxidation is an available technology.	- Chemical oxidation is an available technology. - Air stripping installation and operation is a readily available technology.	- Chemical oxidation is an available technology. - No additional technology needed for the on-property groundwater plume treatment.	- Chemical oxidation is an available technology. - Air stripping installation and operation is a readily available technology.
7. Cost[1]							
a. Capital Costs[2]	- Estimated capital cost is $ 0. - These costs do not include the discontinuation of the current remedial systems.	- Estimated capital cost is $ $434,500[3].	- Estimated capital cost is $1,542,000[3].	- Estimated capital cost is $698, 000.	- Estimated capital cost is $1,790,000.	- Estimated capital cost is $1,060,000.	- Estimated capital cost is $2,131,000.
b. Annual Operation and Maintenance Costs	- Estimated operation and maintenance cost is $ 0.	- Estimated operation and maintenance cost is approximately $87,000 per year for 30 years.	- Estimated operation and maintenance cost is between $165,000 and 202,000 per year for 30 years.	- Estimated operation and maintenance cost is between $44,000 and 73,000 per year for 20 years.	- Estimated operation and maintenance cost is between $122,000 and 151,000 per year for 20 years. This time-frame is assumed for conservative cost estimating purposes. Actual time frames will likely be less than Alternative 3 due to the use of a village treatment system.	- Estimated operation and maintenance cost is between $87,000 and $125,000 per year for 15 years.	- Estimated operation and maintenance cost is between $165,000 and $202,000 per year for 15 years.
c. Net Present Worth Costs	- Estimated 30-year net present worth (5% discount rate) is $ 0. See Table A-1 for additional information on cost analysis.	- Estimated 30-year net present worth (7% discount rate) is $1,587,000. See Table A-2 for additional information on cost analysis.	- Estimated 30-year net present worth (7% discount rate) is $3,667,000. See Table A-3 for additional information on cost analysis.	- Estimated 20-year net present worth (7% discount rate) is $1,222,000. See Table A-4 for additional information on cost analysis.	- Estimated 20-year net present worth (7% discount rate) is $3,140,000. See Table A-5 for additional information on cost analysis.	- Estimated 15-year net present worth (7% discount rate) is $1,918,000. See Table A-6 for additional information on cost analysis.	- Estimated 15-year net present worth (7% discount rate) is $3,699,000. See Table A-7 for additional information on cost analysis.

TABLE 6-3
Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility
Rockton, Illinois

CRITERIA	ALTERNATIVE 1 No Action – includes the discontinuation of the current remedial system	ALTERNATIVE 2 On-Property Groundwater Pump and Treat and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 2A On-Property Groundwater Pump and Treat and Off-Property Groundwater Pump and Treat	ALTERNATIVE 3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 3A Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat	ALTERNATIVE 4 On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	ALTERNATIVE 4A On-Property Groundwater Pump and Treat Groundwater VOC Source Treatment and Off-Property Groundwater Pump and Treat
	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating	Symbolic Rating
8. State Acceptance							
	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.	- Not evaluated in this FS. - Will be addressed after review of this FS. In addition, to the extent possible, state acceptance will be discussed in the Proposed Plan issued for public comment.
9. Community Acceptance	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.	- Not evaluated in this FS. - Will be addressed after receiving comments on this FS and the Proposed Plan.

Symbol Definition:

○ Alternative does not meet the requirements of this criteria.
⊙ Alternative partially meets the requirements of this criteria.
● Alternative meets the requirements of this criteria.

Footnotes:

(1) Costs are rounded to the nearest thousand dollars.
(2) In the event that one of the private wells becomes affected by one of the VOC plumes an additional capital cost of $50,000 will be added for each well/residence that needs to be placed on municipal water. However, a decision on the course of action for each well/residence will be made on an individual basis if necessary. Action may include re-drilling the well to a deeper aquifer, connection to municipal water supply, or the installation of point-of-entry treatment. These costs are not included in the costs for the alternatives due to their uncertainty. Similar actions will also be taken if operation of the existing point-of-entry treatment systems in use in the Blackhawk Acres subdivision is required beyond the operational lifetime of these systems.
(3) Includes costs for the extension of extraction and air stripping system into Blackhawk Acres Subdivision.

LAS/las/vlr/BAI/KJQ
N:\Jobs\208\2402\01\wp\tbl\FS_TABLE 6-3 revised 2.doc
2082402.01180101-MAD1

TABLE 6-4

Summary of Detailed Analysis of Alternatives
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Evaluation Criteria	Alternatives						
	1	**2**	**2a**	**3**	**3a**	**4**	**4a**
	No Action	On-Property Groundwater Pump & Treat and Off-Property Groundwater Plumes Exposure Control	On-Property Groundwater Pump & Treat and Off-Property Groundwater Pump & Treat	Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat	On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control	On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat
1. Overall Protection of Human Health and the Environment	O	●	●	●	●	●	●
2. Compliance with ARARs	O	●	●	●	●	●	●
3. Long-Term Effectiveness and Permanence	O	⊙	⊙	●	●	●	●
4. Reduction of Toxicity, Mobility, or Volume Through Treatment	O	⊙	⊙	⊙	⊙	●	●
5. Short-Term Effectiveness	O	●	●	●	●	●	●
6. Implementability	●	●	●	●	●	●	●
7. Cost (Net Present Worth) In the event that one or more of the private wells in either Blackhawk Acres or in the Village becomes affected by one of the VOC plumes, an additional capital cost of $50,000 will be added for each well that needs to be connected to the municipal water supply. However, a decision on the particular course of action (connection to municipal water supply, redrilling of the well to deeper depths, or the installation of point-of-entry treatment systems) for each affected residence will be made on an individual basis. Additionally, similar actions will be taken for the currently affected wells in the subdivision if the operation of the existing point-of-entry treatment systems is necessary beyond their operational lifetime. These costs are not included in the net present worth costs for each alternative due to their uncertainty.	$0	$1,587,000	$3,667,000	$1,222,000	$3,140,000	$1,918,000	$3,699,000
8. State Acceptance	--	--	--	--	--	--	--
9. Community Acceptance	--	--	--	--	--	--	--

Symbolic Definition:
- O Alternative does not fully meet the requirements of this criteria.
- ⊙ Alternative partially meets the requirements of this criteria.
- ● Alternative meets the requirements of this criteria.

LAS/las/vlr/KJQ / N:\Jobs\208\2402\01\wp\tbl\FS_TABLE 6-4 revised 2.doc / 2082402.01180101-MAD1

TABLE 7-1

Comparative Analysis of Alternatives
Beloit Corporation, Rockton Facility NPL SiteRockton, Illinois

ALTERNATIVE CRITERIA	1 No Action		2 On-Property Groundwater Pump & Treat and Off-Property Groundwater Plumes Exposure Control		2a On-Property Groundwater Pump & Treat and Off-Property Groundwater Pump & Treat		3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control		3a Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat		4 On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control		4a On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat		COMMENTS
	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	
1. **Overall Protection of Human Health and the Environment**	○	1.0	●	7.8	●	7.5	●	8.2	●	8.0	●	8.5	●	8.3	- The ratings for the alternatives in this category were determined using an overall assessment of how well the alternatives rated in the other categories (esp. long and short-term effectiveness and compliance with ARARs). An evaluation of the risks posed to the community and environment was also considered. - A greater amount of risk is associated with those alternatives that include construction on the off-property groundwater plume pump and treat system. - The increased risk associated with the chemical oxidation is off-set by the effectiveness of the treatment when combined with the current extraction and air stripping system.
2. **Compliance with ARARs**	●	1.0	●	9.0	●	9.0	●	9.0	●	9.0	●	9.0	●	9.0	- Alternatives 2 through 4a are all in equal compliance with the ARARs.
3. **Long-Term Effectiveness and Permanence**	○	1.0	⊙	7.0	⊙	7.0	●	7.5	●	8.0	●	8.5	●	9.0	- Alternatives that include the treatment of the VOC source area in the on-property plume have lower residual risks associated with them. - The Off-Property Groundwater Plume Pump & Treat is marginally more effective at lowering risk for community members than groundwater monitoring and alternative water supply or treatment contingencies. - Alternatives involving groundwater controls would not limit the availability of water due to the local municipal water supply.
4. **Reduction of Toxicity, Mobility, or Volume Through Treatment**	○	1.0	⊙	5.0	⊙	6.0		7.0		8.0	●	8.5	●	9.0	- Alternatives that include the treatment of the VOC source area in the on-property plume create the highest reduction of toxicity resulting from the affected groundwater. - Alternatives 4 and 4a, which include source treatment and pump & treat the groundwater plume provides additional treatment over Alternatives 3 and 3a which only treat the VOC source area.
5. **Short-Term Effectiveness**	○	1.0	●	9.0	●	7.5	●	8.0	●	7.0	●	8.0	●	7.0	- Alternatives that include construction in the Village of Rockton create more risk for community members and workers, especially in the railroad corridor and the six road crossings. - Negligible difference in environmental impacts between Alternatives 2 through 4a, even with alternatives discharging into the Rock River. - Once implemented Alternatives 2 through 4a are equal because all address the threats created by the groundwater plumes. - Alternatives 3 through 4a have additional risk due to the introduction of hazardous constituents associated with the chemical oxidation treatment.

TABLE 7-1

Comparative Analysis of Alternatives
Beloit Corporation, Rockton Facility NPL SiteRockton, Illinois

ALTERNATIVE CRITERIA	1 No Action		2 On-Property Groundwater Pump & Treat and Off-Property Groundwater Plumes Exposure Control		2a On-Property Groundwater Pump & Treat and Off-Property Groundwater Pump & Treat		3 Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control		3a Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat		4 On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment and Off-Property Groundwater Plumes Exposure Control		4a On-Property Groundwater Pump & Treat, Groundwater VOC Source Treatment and Off-Property Groundwater Pump & Treat		COMMENTS
	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	Symbolic Rating	Numeric Rating	
6. Implementability	●	9.0	●	9.0	●	7.0	●	8.5	●	7.0	●	8.5	●	7.0	- Construction of the pump and treatment in the Village of Rockton would need access, permission, and coordination from the railroad utility, road commission, and municipal utilities. - Alternatives 2, 3, and 4 include groundwater management zones, which have been effectively implemented in the past. - All alternatives would require similar amounts of monitoring. - Materials and subcontractors are available for all alternatives. - Chemical oxidation, which is included in Alternatives 3 through 4a has been approved by the State of Illinois as an effective remediation technology. However, the possibility of additional injections for the chemical oxidation system to be effective does exist.
7. Cost (Net Present Worth)	$0	9.0	$1,587,000	6.0	$3,667,000	1.0	$1,222,000	7.1	$3,140,000	2.6	$1,918,000	5.3	$3,699,000	1.1	- Ratings for costs were determined using a scale where the highest cost was given a rating of 1.0 and the lowest cost was given a rating of 9.0.
8. State Acceptance	—	—	—	—	—	—	—	—	—	—	—	—	—	—	- Will be addressed after review of this FS.
9. Community Acceptance	—	—	—	—	—	—	—	—	—	—	—	—	—	—	- Will be addressed after receiving public comments on this FS and the Proposed Plan.
Total Numeric Rating:		23		52.3		45		55.3		49.6		56.3		50.4	

Symbol Definition

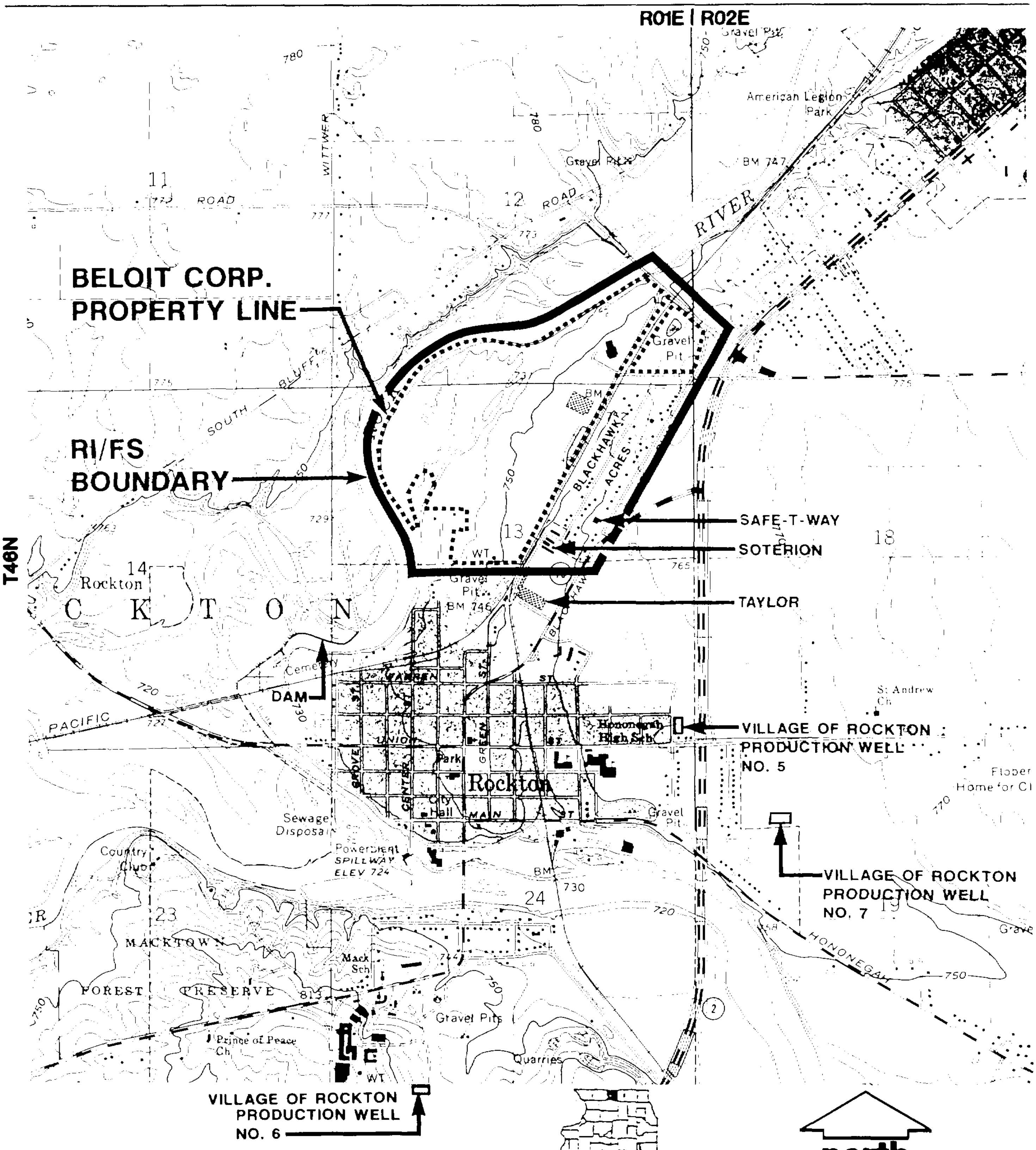
○ Alternative does not meet the requirements of this criteria (Numeric Rating of 1 to 3 assigned).
⊙ Alternative partially meets the requirements of this criteria (Numeric Rating of 4 to 6 assigned).
● Alternative meets the requirements of this criteria (Numeric Rating of 7 to 9 assigned).

LAS/las/vlr/KJQ
N:\Jobs\208\2402\01\wp\tbl\FS_TABLE 7-1 revised.doc
2082402.01180101-MAD1

DRAWINGS

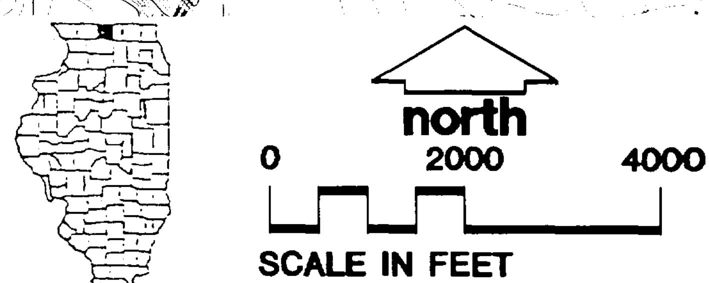
This document has been developed for a specific application and may not be used without the written approval of Montgomery Watson.

QUALITY CONTROL	Graphic Standards DLF 4-24-01	Technical Review	Management Review
	Lead Professional LAS 4-24-01	Project Manager	Other



NOTE

BASE MAP DEVELOPED FROM THE SOUTH BELOIT, ILLINOIS-WISCONSIN, 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1971.



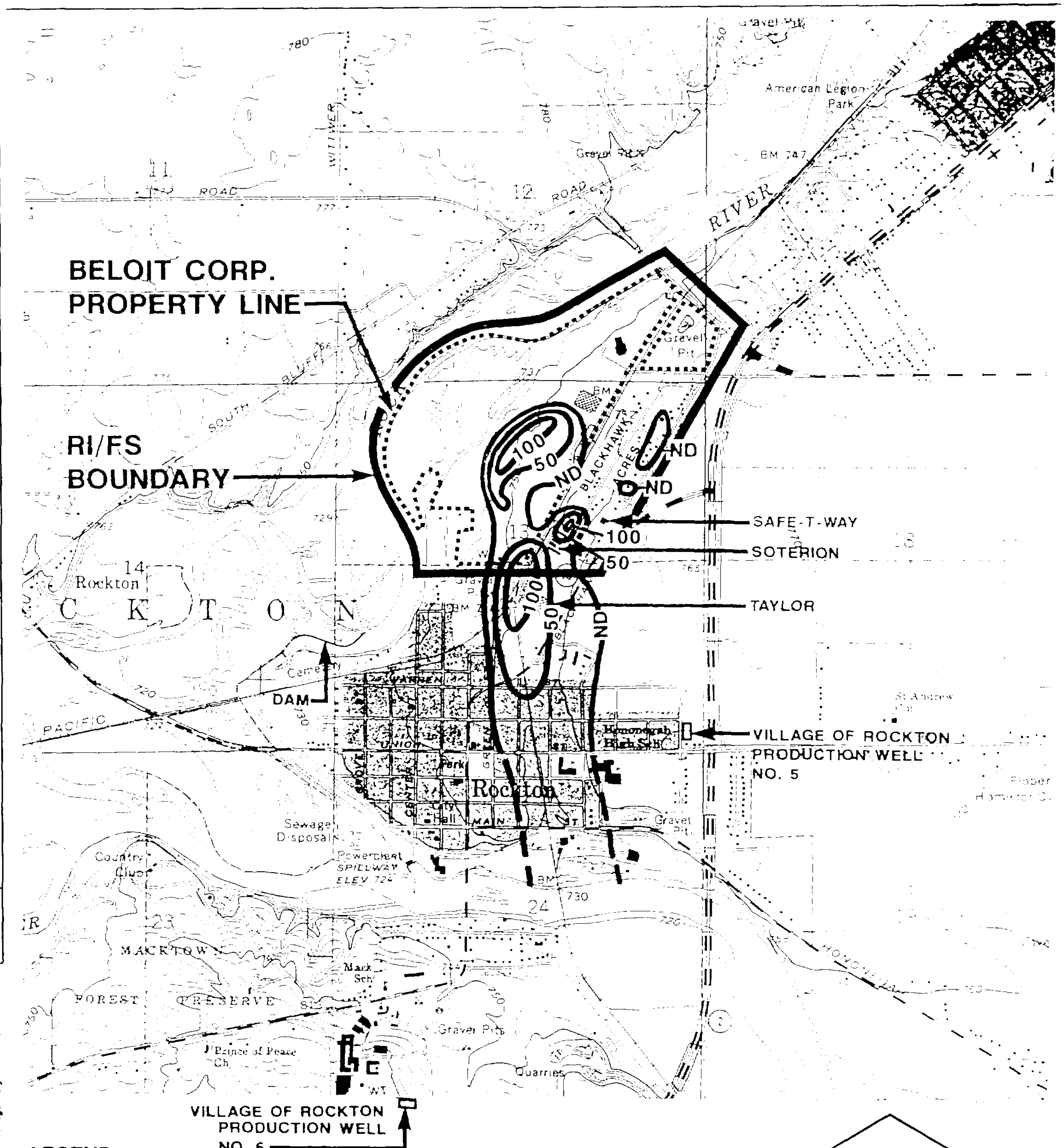
Developed By LAS	Drawn By DLF
Approved By Ken Quinn	Date 8/23/01
Reference 1242077.16180101-A1	
Revisions	

SITE LOCATION MAP

FEASIBILITY STUDY
BELOIT CORPORATION, ROCKTON FACILITY
SECTIONS 12 AND 13, T46N, R1E
TOWN OF ROCKTON, WINNEBAGO CO., ILLINOIS

Drawing Number
2080974
16180101 **A1**

MONTGOMERY WATSON



north

0 2000 4000

SCALE IN FEET

LEGEND

—50— TOTAL CHLORINATED VOCs CONTOUR (ug/L)
(DASHED WHERE INFERRED)

NOTE

BASE MAP DEVELOPED FROM THE SOUTH BELOIT, ILLINOIS– WISCONSIN, 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1971.

Developed By LAS	Drawn By DLF	**TOTAL CHLORINATED VOCs NOVEMBER 1995 - JULY 1996**
Approved By [signature]	Date 8/23/01	FEASIBILITY STUDY BELOIT CORPORATION, ROCKTON FACILITY SECTIONS 12 AND 13, T46N, R1E TOWN OF ROCKTON, WINNEBAGO CO., ILLINOIS
Reference 1242077.08090160–A6		Drawing Number 2080974 16180101 **A2**
Revisions		**MONTGOMERY WATSON**

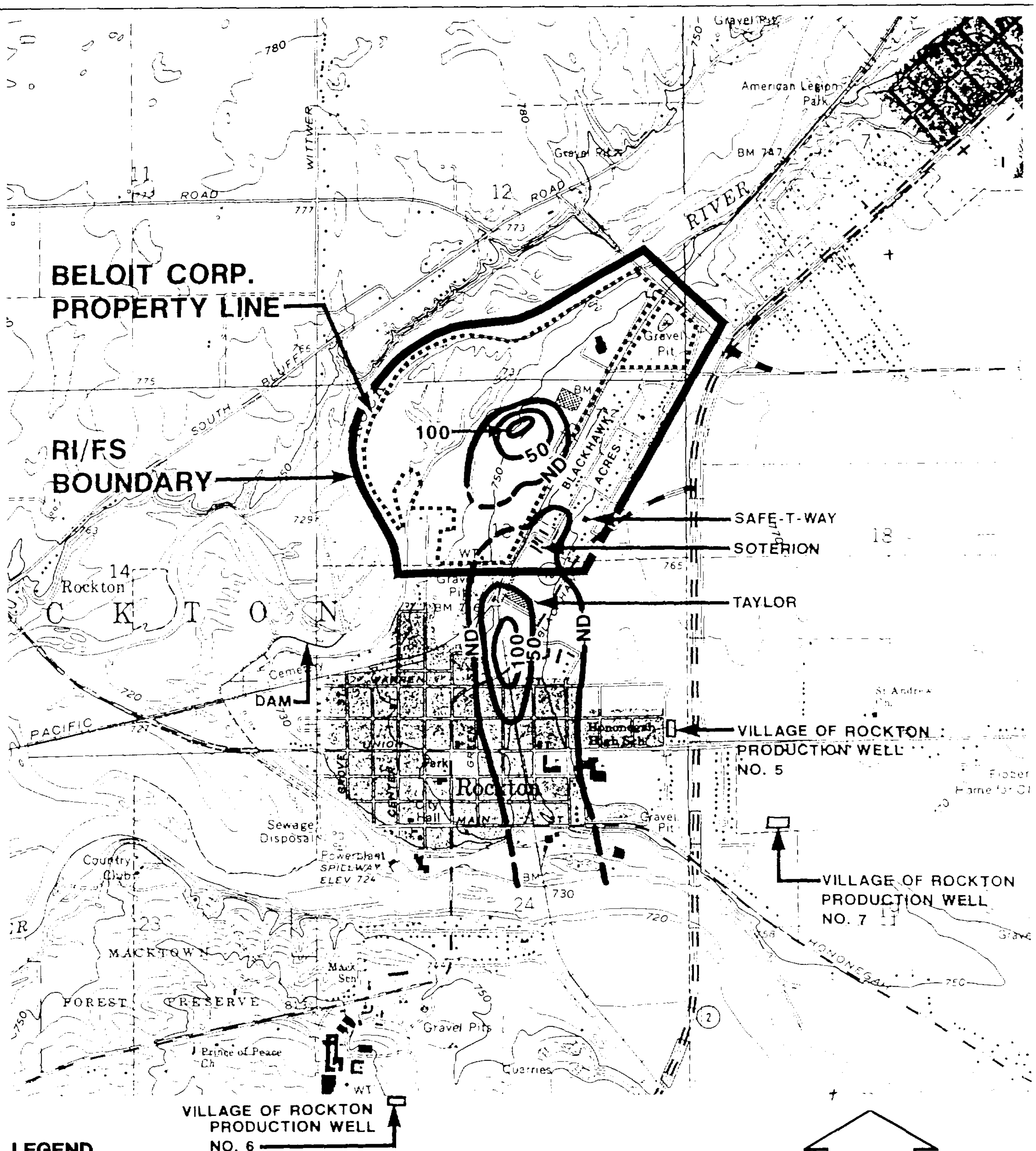
QUALITY CONTROL

Graphic Standards DLF
Lead Professional LAS

Technical Review 4-24-01
Project Manager 4-24-01

Management Review
Other

This document has been developed for a specific application and may not be used without the written approval of Montgomery Watson.



north

0 2000 4000

SCALE IN FEET

LEGEND

—50— TOTAL CHLORINATED VOCs CONTOUR (ug/L)
(DASHED WHERE INFERRED)

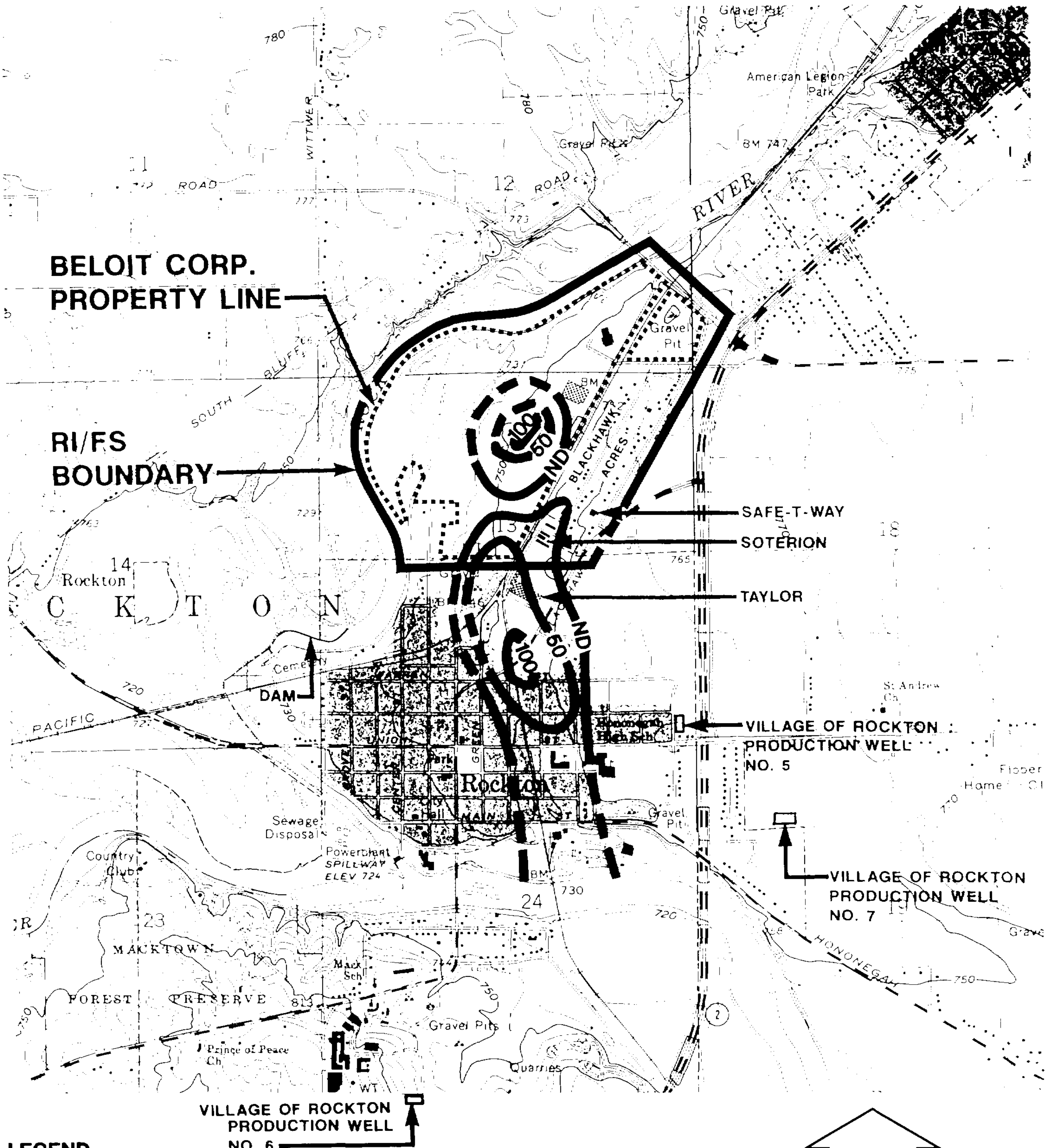
NOTE

BASE MAP DEVELOPED FROM THE SOUTH BELOIT, ILLINOIS– WISCONSIN, 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1971.

Developed By LAS	Drawn By DLF	**TOTAL CHLORINATED VOCs APRIL, 1998**	Drawing Number 2080974 16180101 **A3**
Approved By Ken Quinn	Date 8/23/01	FEASIBILITY STUDY BELOIT CORPORATION, ROCKTON FACILITY SECTIONS 12 AND 13, T46N, R1E TOWN OF ROCKTON, WINNEBAGO CO., ILLINOIS	**MONTGOMERY WATSON**
Reference 1242077.16180101-A3			
Revisions			

QUALITY CONTROL: Graphic Standards DLF 4-24-01; Lead Professional LAS 4-24-01; Technical Review; Project Manager; Management Review; Other

This document has been developed for a specific application and may not be used without the written approval of Montgomery Watson.



LEGEND

—50— TOTAL CHLORINATED VOCs CONTOUR (ug/L)
(DASHED WHERE INFERRED)

NOTE

BASE MAP DEVELOPED FROM THE SOUTH BELOIT, ILLINOIS– WISCONSIN, 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1971.

north

0 2000 4000

SCALE IN FEET

QUALITY CONTROL			
Graphic Standards DLF	4-24-01	Technical Review	Management Review
Lead Professional LSA	4-24-01	Project Manager	Other

This document has been developed for a specific application and may not be used without the written approval of Montgomery Watson.

Developed By LAS	Drawn By DLF	**TOTAL CHLORINATED VOCs JANUARY, 2001**	Drawing Number 2080974 16180101 **A4**
Approved By Ken Quinn	Date 8/23/01	FEASIBILITY STUDY BELOIT CORPORATION, ROCKTON FACILITY SECTIONS 12 AND 13, T46N, R1E TOWN OF ROCKTON, WINNEBAGO CO., ILLINOIS	**MONTGOMERY WATSON**
Reference 1242077.16180101–A3			
Revisions			

TABLE A-1

Feasibility Study Alternatives Cost Estimates
Alternative 1: No Action
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

DESCRIPTION	QTY	UNIT	UNIT COST	EXTENDED COST
DIRECT & INDIRECT CAPITAL COSTS				
None				
ANNUAL O&M ESTIMATED COSTS				
None				

Notes:
1. This alternative is the NCP required "no action" alternative.
2. For purposes of the FS the cost of the no action alternative is considered to be zero. However, there would be costs associated with this alternative, including the abandonment of wells and removal of current remediation systems.

MLN/mln/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (No Action - Alt 1)
2082402.01180101-MAD1

Table A-3
Feasibility Study Alternatives Cost Estimates
Alternative 2a: On-Property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Cost Estimate Assumptions and Notes

Task Number	
1a	It is assumed that up to two new wells will be required to adequately monitor the groundwater plume over the groundwater management zone area.
1b	Two access agreements are assumed necessary for installation of these new wells.
1c	Costs are based on an estimate for time necessary for assembling necessary information for the submittals for establishing the GW Management Zone.
2a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
2b	One new extraction well is assumed necessary for the extension of the ISCA treatment system. This well is assumed to be located next to monitoring well W44C.
2c	Plumbing is identical to plumbing type used in existing system. Costs are based on costs for the existing system including additional costs for trenching in the pavement and repair and crossing the railroad line and repair.
2d	Access ports are assumed to be installed at the corners of the plumbing from the extraction well to the treatment building and midway along each leg, at a cost of approximately $2,000 each, the same as incurred for the installation of the existing ISCA.
2e	This additional submersible pump is assumed to be similar to the original ISCA submersible pumps in cost and is the same type of design/make as used in the existing ISCA extraction wells.
2f	Additional electrical requirements include the extension of electrical power through the plumbing trench to the new extraction well and submersible pump. Costs are a conservative estimate, based on similar projects.
2g	Additional plumbing requirements are for the various plumbing, valves, and connections required to bring the new extraction line into the existing building and tie it into the treatment system.
2h	Additional process control modification costs include costs for the interfacing of the new extraction well into the existing control system and reprogramming of the PLC system.
2i	It is assumed that three separate access agreements will be necessary for the new extraction well and trenching of the extraction line to the existing treatment system.
2j	Startup/shakedown costs are based on three days of engineering time necessary to test and bring the system into full operation.
2k	Modifications or resubmittal of the existing discharge permit will be necessary following the expansion of the ISCA system.
3a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
3b	Extraction well drilling costs are for the installation of the 4 extraction wells, based on costs incurred for the original ISCA system, with some additional costs due to the potential deeper depth of these wells.
3c	Wellhead manhole costs are for the installation of concrete access manholes around each extraction well.
3d	Plumbing costs include costs for tying each of the new extraction wells into a common header line and bringing the header line into the proposed remediation building. It is assumed that 2,400 linear feet of trenching (mostly through pavement), bedding, and piping will be necessary.
3e	It is estimated that approximately 85 square yards of pavement will require removal and replacement to facilitate the trenching of the individual extraction lines and header into the treatment building.
3f	It is assumed that 12 total utility crossings will be necessary for pipe trenches.
3g	It is assumed that 10 total pipe access ports will be necessary, at each corner and approximately midway along each conveyance leg.

Table A-3
Feasibility Study Alternatives Cost Estimates
Alternative 2a: On-Property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
3h	Plumbing from the treatment building to the Rock River discharge point (outfall) is assumed at approximately 1,500 LF and includes costs for clearing, trenching, pipe bedding, piping, and backfilling along this route. It assumes trenching may be through asphalt and that the treatment building is located midway between the 4 proposed extraction wells.
3i	A specialized concrete outfall structure is assumed necessary to prevent riverbank erosion.
3j	A 400 square foot treatment building, with a 10 ft. roof and built of concrete masonry is assumed to be used. All necessary building controls and utilities are included in this task cost.
3k	3 hp electric submersible pumps are assumed necessary for each extraction well. Costs are based on current manufacturer estimates.
3l	A 10 hp centrifugal pump is assumed necessary for the conveyance header line to the treatment building. Costs are based on current manufacturer estimates.
3m	A small ½ hp transfer pump is assumed necessary to provide additional head to the water prior to its air stripping.
3n	3 separate air strippers are assumed necessary to completely handle the anticipated total volume of flow (200 gpm) . These units are similar in design to the units installed on the ISCA system. Costs are based on incurred costs for the ISCA strippers.
3o	Transfer tanks are assumed necessary to provide a constant non-varying flow of water to the air stripper units. Costs for these tanks are based on manufacturer estimates.
3p	An iron sequestering agent system is assumed necessary to prevent the clogging of the air stripper units. Costs for this system are based on manufacturer estimates.
3q	A bag filter system is assumed necessary to prevent the clogging of the air stripper units. Costs for this system are based on manufacturer estimates.
3r	Various internal plumbing in the treatment building will be necessary, including gauges, piping, and valves.
3s	Various electrical connection and controls/meters are included in this task. The controls include PLC controls and programming.
3t	The cost for this task is based on an estimate to extend a new electrical service and meter to the proposed treatment building.
3u	Startup/shakedown costs assume that 4 days will be necessary to complete this task and include all necessary testing and equipment.
4a	Costs are based on a conservative estimate of the expenses that may be incurred to place a deed restriction on the property that prohibits future groundwater use.
5	Engineering activities and design costs include all necessary design reports, submittals, permitting, and general regulatory agency contact for the implementation of this alternative. These costs are assumed at 12% of the total construction costs, as recommended through EPA guidance materials.
6	Construction management costs are based on providing oversight for the construction activities that are included as part of this alternative. These costs are assumed at 8% of the construction costs, as recommended through EPA guidance materials.
7	Project management costs include all necessary regulatory contact, invoicing, and general project tracking. These costs are assumed at 6% of the construction costs, as recommended through EPA guidance materials.

Table A-3
Feasibility Study Alternatives Cost Estimates
Alternative 2a: On-Property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
8a	Annual ISCA operation and maintenance costs are based on the current expenses for labor to operate this system. The potential expansion of the system into the Blackhawk Acres subdivision (one new extraction well) would be expected to only add marginal costs for the system operations and monitoring.
8b	Annual ISCA monitoring costs are for the daily PLC monitoring of the system via modem and recording system operational information.
8c	Discharge monitoring costs are for the sampling and analysis of the required monthly system effluent.
8d	Quarterly groundwater monitoring costs are for continuation of the current sampling and analysis (16 samples assumed; 1 additional for the potential new ISCA extraction well) of the existing on-property and off-property groundwater monitoring wells and quarterly reporting of these results. This quarterly report would also include results from the operation of the ISCA system (same as existing report).
8e	Annual ISCA electrical costs are based on the annual electrical use of the existing ISCA system and an additional 10,000 kW for the new extraction well and transfer pump.
8f	Periodic (every 5 years assumed) maintenance costs are included to cover the replacement/repair of pumps, valves, blowers, etc. as necessary for the ISCA system.
9a	GW management zone sampling and reporting costs include the necessary labor for sampling the 11 wells that are assumed included in this zone on an annual basis for VOCs and preparing one annual report summarizing these results. This GW management zone monitoring program may or may not include wells that are part of the quarterly groundwater monitoring program (Task 8d).
9b	Annual Blackhawk Acres private well sampling costs are based on the current costs for annually sampling the groundwater for those residences with point-of-entry treatment systems.
10a	Operational labor costs are for the labor necessary to insure that the off-site pump and treat system is maintained and operated continuously throughout the year.
10b	Maintenance labor costs are assumed based on an estimate of the amount of labor necessary to maintain the system in proper working condition.
10c	Maintenance materials include various equipment, chemicals, and other costs for the operation of the system.
10d	Electrical costs are based on the necessary electrical requirements for the various pumps and air stripper blowers.
10e	System monitoring costs include monthly discharge monitoring analyses and labor, quarterly system performance analyses, and other various monitoring activities (20 assumed events/samples).
10f	Reporting costs are for the quarterly reporting of the system operation and monitoring activities.
11	The point-of-entry treatment systems are assumed to require approximately $1,000 of maintenance/inspections every 5 years. It is further assumed that these systems will not be maintained after year 10. Costs included for year 10 are for the removal of these units from the various residences.
12	Five year reviews are required according to the NCP. The costs for these reviews are based on a conservative estimate of the amount of engineering time and reporting necessary for these reviews.
13	Annual project management costs are assumed at 8% of the annual costs. These costs include necessary regulatory contact, client contact, progress reporting, and invoicing.

A

COST ESTIMATE INFORMATION

TABLE A-2

Feasibility Study Alternatives Cost Estimates
Alternative 2: On-property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	CONSTRUCTION/CAPITAL COSTS				
1	**Additional Groundwater Monitoring Costs (GW Mgmt Zone)**				
a	Well Drilling Costs	150	VLF	$40	$6,000
b	Access Agreements for Wells	2	EA	$2,000	$4,000
c	Groundwater Management Zone Setup	1	LS	$20,000	$20,000
2	**ISCA Extension into Blackhawk Acres Subdivision**				
a	Construction Mobilization/Demobilization	1	LS	$5,000	$5,000
b	Additional Groundwater Extraction Well	1	EA	$4,000	$4,000
c	3"/6" double wall HDPE conveyance pipe from new extraction well	2,300	FT	$85	$195,500
	to treatment building, including trenching, bedding, and backfilling				
d	Piping access ports/manholes	3	EA	$2,000	$6,000
e	Additional electric submersible pump	1	EA	$2,500	$2,500
f	Additional electrical requirements - wiring of pumps	1	LS	$5,000	$5,000
g	Additional plumbing requirements	1	LS	$3,000	$3,000
h	Additional process control modifications	1	LS	$3,000	$3,000
i	Access Agreements for new extraction well and piping	3	EA	$5,000	$15,000
j	Startup/shakedown	3	DAYS	$1,500	$4,500
k	Discharge permit modifications	1	LS	$3,000	$3,000
	SUBTOTAL CONSTRUCTION/CAPITAL COSTS				**$276,500**
	CONTINGENCY (15%)			**$42,000**	
	SUBTOTAL				**$318,500**
	INSTITUTIONAL CONTROL COSTS				
3	**On-property GW Control**				
a	Deed Restriction	1	LS	$10,000	$10,000
4	**ENGINEERING ACTIVITIES AND DESIGN COSTS (15%)**	1	LS	$48,000	$48,000
5	**CONSTRUCTION MANAGEMENT COSTS (10%)**	1	LS	$32,000	$32,000
6	**PROJECT MANAGEMENT COSTS (8%)**	1	LS	$26,000	$26,000
	TOTAL IMPLEMENTATION COSTS				**$434,500**

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	ANNUAL O&M COSTS				
7	**On-property GW Control**				
a	ISCA Operation & Maintenance Labor Costs	1	LS	$15,000	$15,000
b	ISCA Monitoring Costs (remote)	1	LS	$10,000	$10,000
c	Discharge Monitoring	12	EA	$800	$9,600
d	Quarterly GW Monitoring Sampling & Reporting Costs	4	EA	$7,000	$28,000
e	Annual ISCA Electrical Costs	50,000	kW-Hrs	$0.10	$5,000
f	Periodic maintenance/repair costs (every 5 years)	1	LS	$7,500	$7,500
8	**Off-property Exposure Control**				
a	GW Management Zone, Well Sampling & Reporting	1	LS	$7,000	$7,000
b	Annual Blackhawk Acres Private Well Sampling Costs (analytical & labor)	1	LS	$5,000	$5,000
9	**Existing Point-of-Entry Treatment System Maintenance Costs (every 5 years)** (3)	4	EA	$1,000	$4,000
10	**5 Year Review Costs**	1	LS	$25,000	$25,000
	SUBTOTAL ANNUAL COSTS (not including Tasks 7f, 9 and 10)				$79,600
11	**ANNUAL PROJECT MANAGEMENT (8%)**	1	LS	$7,000	$7,000
	TOTAL ANNUAL COSTS (not including Tasks 7f, 9, and 10)				**$86,600**

TABLE A-2

Feasibility Study Alternatives Cost Estimates
Alternative 2: On-property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Year	Capitol/Construction Costs	O&M Costs	Periodic Costs [2]	Total Costs	7% PNW Factor	Present Net Worth
0	$434,500	$0	$0	$434,500	1	$434,500
1	$0	$86,600		$86,600	0.9346	$80,936
2	$0	$86,600		$86,600	0.8734	$75,636
3	$0	$86,600		$86,600	0.8163	$70,692
4	$0	$86,600		$86,600	0.7629	$66,067
5	$0	$86,600	$36,500	$123,100	0.7130	$87,770
6	$0	$86,600		$86,600	0.6663	$57,702
7	$0	$86,600		$86,600	0.6227	$53,926
8	$0	$86,600		$86,600	0.5820	$50,401
9	$0	$86,600		$86,600	0.5439	$47,102
10 [3]	$0	$86,600	$36,500	$123,100	0.5083	$62,572
11	$0	$86,600		$86,600	0.4751	$41,144
12	$0	$86,600		$86,600	0.4440	$38,450
13	$0	$86,600		$86,600	0.4150	$35,939
14	$0	$86,600		$86,600	0.3878	$33,583
15	$0	$86,600	$32,500	$119,100	0.3624	$43,162
16	$0	$86,600		$86,600	0.3387	$29,331
17	$0	$86,600		$86,600	0.3166	$27,418
18	$0	$86,600		$86,600	0.2959	$25,625
19	$0	$86,600		$86,600	0.2765	$23,945
20	$0	$86,600	$32,500	$119,100	0.2584	$30,775
21	$0	$86,600		$86,600	0.2415	$20,914
22	$0	$86,600		$86,600	0.2257	$19,546
23	$0	$86,600		$86,600	0.2109	$18,264
24	$0	$86,600		$86,600	0.1971	$17,069
25	$0	$86,600	$32,500	$119,100	0.1842	$21,938
26	$0	$86,600		$86,600	0.1722	$14,913
27	$0	$86,600		$86,600	0.1609	$13,934
28	$0	$86,600		$86,600	0.1504	$13,025
29	$0	$86,600		$86,600	0.1406	$12,176
30 [1]	$0	$86,600	$50,000	$136,600	0.1314	$17,949
		Total Cost		**$3,253,000**		
	Total Net Present Worth					**$1,587,000**

Footnotes:
(1) The year 30 costs include costs for closure activities and reporting.
(2) Periodic costs include closure costs (see footnote 1) and the annual costs for Tasks 7c, 9, and 10.
(3) Task 9 is assumed to be discontinued after 10 years.

General Notes:
1. Present Net Worth (PNW) cost is based on a 7% discount rate.
2. A 30 year lifetime is assumed for this Alternative to provide cleanup and closure for the site.

MLN/mln/BAI/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (Alt 2)
2082402.01180101-MAD1

Table A-2
Feasibility Study Alternatives Cost Estimates
Alternative 2: On-Property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Cost Estimate Assumptions and Notes

Task Number	
1a	It is assumed that up to two new wells (75 ft deep) will be required to adequately monitor the groundwater plume over the groundwater management zone area. The costs are from previous projects.
1b	Two access agreements are assumed necessary for installation of these new wells.
1c	Costs are based on an estimate for time necessary for assembling necessary information for the submittals for establishing the GW Management Zone.
2a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
2b	One new extraction well is assumed necessary for the extension of the ISCA treatment system. This well is assumed to be located next to monitoring well W44C. Costs are from similar projects.
2c	Plumbing is identical to plumbing type used in existing system. Costs are based on costs for the existing system including additional costs for trenching in the pavement and repair and crossing the railroad line and repair.
2d	Access ports are assumed to be installed at the corners of the plumbing from the extraction well to the treatment building and midway along each leg, at a cost of approximately $2,000 each, the same as incurred for the installation of the existing ISCA.
2e	This additional submersible pump is assumed to be similar to the original ISCA submersible pumps in cost and is the same type of design/make as used in the existing ISCA extraction wells.
2f	Additional electrical requirements include the extension of electrical power through the plumbing trench to the new extraction well and submersible pump. Costs are a conservative estimate, based on similar projects.
2g	Additional plumbing requirements are for the various plumbing, valves, and connections required to bring the new extraction line into the existing building and tie it into the treatment system.
2h	Additional process control modification costs include costs for the interfacing of the new extraction well into the existing control system and reprogramming of the PLC system.
2i	It is assumed that three separate access agreements will be necessary for the new extraction well and trenching of the extraction line to the existing treatment system.
2j	Startup/shakedown costs are based on three days of engineering time necessary to test and bring the system into full operation.
2k	Modifications or resubmittal of the existing discharge permit will be necessary following the expansion of the ISCA system.
3a	Costs are based on a conservative estimate of the expenses that may be incurred to place a deed restriction on the property that prohibits future groundwater use.
4	Engineering activities and design costs include all necessary design reports, submittals, permitting, and general regulatory agency contact for the implementation of this alternative. These costs are assumed at 15% of the total construction costs, as recommended through EPA guidance materials.
5	Construction management costs are based on providing oversight for the construction activities that are included as part of this alternative. These costs are assumed at 10% of the construction costs, as recommended through EPA guidance materials.
6	Project management costs include all necessary regulatory contact, invoicing, and general project tracking. These costs are assumed at 8% of the construction costs, as recommended through EPA guidance materials.

Table A-2
Feasibility Study Alternatives Cost Estimates
Alternative 2: On-Property Pump and Treat and
Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
7a	Annual ISCA operation and maintenance costs are based on the current expenses for labor to operate this system. The potential expansion of the system into the Blackhawk Acres subdivision (one new extraction well) would be expected to only add marginal costs for the system operations and monitoring.
7b	Annual ISCA monitoring costs are for the daily PLC monitoring of the system via modem and recording system operational information.
7c	Discharge monitoring costs are for the sampling and analysis of the required monthly system effluent.
7d	Quarterly groundwater monitoring costs are for continuation of the current sampling and analysis (16 samples assumed; 1 additional for the potential new ISCA extraction well) of the existing on-property and off-property groundwater monitoring wells and quarterly reporting of these results. This quarterly report would also include results from the operation of the ISCA system (same as existing report).
7e	Annual ISCA electrical costs are based on the annual electrical use of the existing ISCA system and an additional 10,000 kW for the new extraction well and transfer pump.
7f	Periodic (every 5 years assumed) maintenance costs are included to cover the replacement/repair of pumps, valves, blowers, etc. as necessary for the ISCA system.
8a	GW management zone sampling and reporting costs include the necessary labor for sampling the 11 wells that are assumed included in this zone on an annual basis for VOCs and preparing one annual report summarizing these results. This GW management zone monitoring program may or may not include wells that are part of the quarterly groundwater monitoring program (Task 7d).
8b	Annual Blackhawk Acres private well sampling costs are based on the current costs for annually sampling the groundwater for those residences with point-of-entry treatment systems.
9	The point-of-entry treatment systems are assumed to require approximately $1,000 of maintenance/inspections every 5 years. It is further assumed that these systems will not be maintained after year 10. Costs included for year 10 are for the removal of these units from the various residences.
10	Five year reviews are required according to the NCP. The costs for these reviews are based on an estimate of the amount of engineering time and reporting necessary for these reviews.
11	Annual project management costs are assumed at 8% of the annual costs, similar to task 6. These costs include necessary regulatory contact, client contact, progress reporting, and invoicing.

TABLE A-3

Feasibility Study Alternatives Cost Estimates
Alternative 2a: On-Property Pump and Treat and
Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
1	**CONSTRUCTION/CAPITAL COSTS** **Additional Groundwater Monitoring Costs (GW Mgmt Zone)**				
a	Well Drilling Costs	150	VLF	$40	$6,000
b	Access Agreements for Wells	2	EA	$2,000	$4,000
c	Groundwater Management Zone Setup	1	LS	$20,000	$20,000
2	**ISCA Extension into Blackhawk Acres Subdivision**				
a	Construction Mobilization/Demobilization	1	LS	$5,000	$5,000
b	Additional Groundwater Extraction Well	1	EA	$4,000	$4,000
c	3"/6" double wall HDPE conveyance pipe from new extraction well	2,300	FT	$85	$195,500
	to treatment building, including trenching, bedding, and backfilling				
d	Piping access ports/manholes	3	EA	$2,000	$6,000
e	Additional electric submersible pump	1	EA	$2,500	$2,500
f	Additional electrical requirements - wiring of pumps	1	LS	$5,000	$5,000
g	Additional plumbing requirements	1	LS	$3,000	$3,000
h	Additional process control modifications	1	LS	$3,000	$3,000
i	Access Agreements for new extraction well and piping	3	EA	$5,000	$15,000
j	Startup/shakedown	3	DAYS	$1,500	$4,500
k	Discharge permit modifications	1	LS	$3,000	$3,000
3	**Off-Property Plumes Pump and Treat System**				
a	Construction mobilization and demobilization	1	LS	$7,100	$7,100
b	Groundwater extraction well drilling and installation	4	EA	$4,500	$18,000
c	Wellhead manholes	4	EA	$2,500	$10,000
d	Plumbing	2,400	LF	$85	$204,000
e	Pavement demolition and replacement for plumbing trenches	85	SQ YD	$50	$4,250
f	Utility crossings	12	EA	$2,000	$24,000
g	Conveyance piping access ports	10	EA	$2,000	$20,000
h	Plumbing from treatment building to outfall structure	1,500	LF	$85	$127,500
i	Outfall structure	1	EA	$10,000	$10,000
j	Treatment building	1	EA	$50,000	$50,000
k	Electric submersible pumps	4	EA	$2,500	$10,000
l	Forcemain centrifugal pump	1	EA	$12,000	$12,000
m	Transfer pump	1	EA	$1,200	$1,200
n	Diffused air strippers	3	EA	$60,000	$180,000
o	Transfer tanks	2	EA	$1,800	$3,600
p	Iron sequestering agent system	1	EA	$2,500	$2,500
q	Bag filter system	1	EA	$1,500	$1,500
r	Internal plumbing	1	LS	$35,000	$35,000
s	Electrical and Controls/Meters	1	LS	$45,000	$45,000
t	Electrical service to treatment building	1	LS	$6,000	$6,000
u	Startup/Shakedown	4	DAYS	$1,800	$7,200
	SUBTOTAL CONSTRUCTION/CAPITAL COSTS				**$1,055,350**
	CONTINGENCY (15%)			**$159,000**	
	SUBTOTAL				**$1,214,350**
	INSTITUTIONAL CONTROL COSTS				
4	**On-property GW Control**				
a	Deed Restriction	1	LS	$10,000	$10,000
5	**ENGINEERING ACTIVITIES AND DESIGN COSTS (12%)**	1	LS	$146,000	$146,000
6	**CONSTRUCTION MANAGEMENT COSTS (8%)**	1	LS	$98,000	$98,000
7	**PROJECT MANAGEMENT COSTS (6%)**	1	LS	$73,000	$73,000
	TOTAL IMPLEMENTATION COSTS				**$1,542,000**

TABLE A-3

Feasibility Study Alternatives Cost Estimates
Alternative 2a: On-Property Pump and Treat and
Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	ANNUAL O&M COSTS				
8	**On-property GW Control**				
a	ISCA Operation & Maintenance Labor Costs	1	LS	$15,000	$15,000
b	ISCA Monitoring Costs (remote)	1	LS	$10,000	$10,000
c	Discharge Monitoring	12	EA	$800	$9,600
d	Quarterly GW Monitoring Sampling & Reporting Costs	4	EA	$7,000	$28,000
e	Annual ISCA Electrical Costs	50,000	kW-Hrs	$0.10	$5,000
f	Periodic maintenance/repair costs (every 5 years)	1	LS	$7,500	$7,500
9	**Off-property Exposure Control**				
a	GW Management Zone, Well Sampling & Reporting	1	LS	$7,000	$7,000
b	Annual Blackhawk Acres Private Well Sampling Costs (analytical & labor)	1	LS	$5,000	$5,000
10	**Off-property plumes pump and treat system**				
a	Operational labor	156	HRS	$50	$7,800
b	Maintenance labor	156	HRS	$45	$7,020
c	Maintenance materials	1	LS	$5,000	$5,000
d	Electrical power	165,000	kW-Hrs	$0.10	$16,500
e	System monitoring (NPDES testing, analytical, etc.)	20	EA	$1,000	$20,000
f	Reporting	4	EA	$4,000	$16,000
11	**Existing Point-of-Entry Treatment System Maintenance Costs (every 5 years)** (3)	4	EA	$1,000	$4,000
12	**5 Year Review Costs**	1	LS	$25,000	$25,000
	SUBTOTAL ANNUAL COSTS (not including Tasks 8f, 11, and 12)				$152,000
13	**ANNUAL PROJECT MANAGEMENT (8%)**	1	LS	$13,000	$13,000
	TOTAL ANNUAL COSTS (not including Tasks 8f, 11, and 12)				**$165,000**

Year	Capitol/Construction Costs	O&M Costs	Periodic Costs (2)	Total Costs	7% PNW Factor	Present Net Worth
0	$1,542,000	$0	$0	$1,542,000	1	$1,542,000
1	$0	$165,000		$165,000	0.9346	$154,209
2	$0	$165,000		$165,000	0.8734	$144,111
3	$0	$165,000		$165,000	0.8163	$134,690
4	$0	$165,000		$165,000	0.7629	$125,879
5	$0	$165,000	$36,500	$201,500	0.7130	$143,670
6	$0	$165,000		$165,000	0.6663	$109,940
7	$0	$165,000		$165,000	0.6227	$102,746
8	$0	$165,000		$165,000	0.5820	$96,030
9	$0	$165,000		$165,000	0.5439	$89,744
10 (3)	$0	$165,000	$36,500	$201,500	0.5083	$102,422
11	$0	$165,000		$165,000	0.4751	$78,392
12	$0	$165,000		$165,000	0.4440	$73,260
13	$0	$165,000		$165,000	0.4150	$68,475
14	$0	$165,000		$165,000	0.3878	$63,987
15	$0	$165,000	$32,500	$197,500	0.3624	$71,574
16	$0	$165,000		$165,000	0.3387	$55,886
17	$0	$165,000		$165,000	0.3166	$52,239
18	$0	$165,000		$165,000	0.2959	$48,824
19	$0	$165,000		$165,000	0.2765	$45,623
20	$0	$165,000	$32,500	$197,500	0.2584	$51,034
21	$0	$165,000		$165,000	0.2415	$39,848
22	$0	$165,000		$165,000	0.2257	$37,241
23	$0	$165,000		$165,000	0.2109	$34,799
24	$0	$165,000		$165,000	0.1971	$32,522
25	$0	$165,000	$32,500	$197,500	0.1842	$36,380
26	$0	$165,000		$165,000	0.1722	$28,413
27	$0	$165,000		$165,000	0.1609	$26,549
28	$0	$165,000		$165,000	0.1504	$24,816
29	$0	$165,000		$165,000	0.1406	$23,199
30 (1)	$0	$165,000	$50,000	$215,000	0.1314	$28,251
		Total Cost		**$6,713,000**		
	Total Net Present Worth					**$3,667,000**

Footnotes:
(1) The year 30 costs include costs for closure activities and reporting.
(2) Periodic costs include closure costs (see footnote 1) and the annual costs for Tasks 8f, 11, and 12.
(3) Task 11 is assumed to be discontinued after 10 years.

General Notes:
1. Present Net Worth (PNW) cost is based on a 7% discount rate.
2. A 30 year lifetime is assumed for this Alternative to provide cleanup and closure for the site.

MLN/las/BAI/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (Alt 2a)
2082402.01180101-MAD1

TABLE A-4

Feasibility Study Alternatives Cost Estimates
Alternative 3: Source Treatment and Off-Property
Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
1	**CONSTRUCTION/CAPITAL COSTS** **Additional Groundwater Monitoring Costs (GW Mgmt Zone)**				
a	Well Drilling Costs	150	VLF	$40	$6,000
b	Access Agreements for Wells	2	EA	$2,000	$4,000
c	Groundwater Management Zone Setup	1	LS	$20,000	$20,000
2	**Source Treatment**				
a	Injection Costs	1	LS	$340,000	$340,000
b	Injection Point Drilling Costs (18 wells at 50 VLF each)	900	VLF	$40	$36,000
c	Drill Cuttings Hauling to Landfill	100	TONS	$20	$2,000
d	Drill Cuttings Disposal	100	TONS	$26	$2,600
e	Performance Sampling Analytical Costs	104	EA	$90	$9,360
f	Performance Sampling Labor Costs	176	HRS	$100	$17,600
3	**Existing ISCA System Moth balling**	1	LS	$10,000	$10,000
	SUBTOTAL CONSTRUCTION/CAPITAL COSTS				**$447,560**
	CONTINGENCY (15%)			**$68,000**	
	SUBTOTAL				**$515,560**
	INSTITUTIONAL CONTROL COSTS				
4	**On-property GW Control**				
a	Deed Restriction	1	LS	$10,000	$10,000
5	**ENGINEERING ACTIVITIES AND DESIGN COSTS (15%)**	1	LS	$78,000	$78,000
6	**CONSTRUCTION MANAGEMENT COSTS (10%)**	1	LS	$52,000	$52,000
7	**PROJECT MANAGEMENT COSTS (8%)**	1	LS	$42,000	$42,000
	TOTAL IMPLEMENTATION COSTS				**$698,000**

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	ANNUAL O&M COSTS				
8	**Site Groundwater Monitoring & Performance Monitoring Costs**				
a	Quarterly GW Monitoring Sampling & Reporting Costs	4	EA	$7,000	$28,000
9	**Off-property Exposure Control** (3)				
a	GW Management Zone, Well Sampling & Reporting	1	LS	$7,000	$7,000
b	Annual Blackhawk Acres Private Well Sampling Costs (analytical & labor)	1	LS	$5,000	$5,000
10	**Existing Point-of-Entry Treatment System Maintenance Costs (every 5 years)** (3)	4	EA	$1,000	$4,000
11	**5 Year Review Costs**	1	LS	$25,000	$25,000
	SUBTOTAL ANNUAL COSTS (not including Tasks 10 and 11)				$40,000
12	**ANNUAL PROJECT MANAGEMENT (8%)**	1	LS	$4,000	$4,000
	TOTAL ANNUAL COSTS (not including Tasks 10 and 11)				**$44,000**

TABLE A-4

Feasibility Study Alternatives Cost Estimates
Alternative 3: Source Treatment and Off-Property
Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Year	Capitol/Construction Costs	O&M Costs	Periodic Costs (2)	Total Costs	7% PNW Factor	Present Net Worth
0	$698,000	$0	$0	$698,000	1	$698,000
1	$0	$44,000		$44,000	0.9346	$41,122
2	$0	$44,000		$44,000	0.8734	$38,430
3	$0	$44,000		$44,000	0.8163	$35,917
4	$0	$44,000		$44,000	0.7629	$33,568
5	$0	$44,000	$29,000	$73,000	0.7130	$52,049
6	$0	$44,000		$44,000	0.6663	$29,317
7	$0	$44,000		$44,000	0.6227	$27,399
8	$0	$44,000		$44,000	0.5820	$25,608
9	$0	$44,000		$44,000	0.5439	$23,932
10	$0	$44,000	$29,000	$73,000	0.5083	$37,106
11	$0	$44,000		$44,000	0.4751	$20,904
12	$0	$44,000		$44,000	0.4440	$19,536
13	$0	$44,000		$44,000	0.4150	$18,260
14	$0	$44,000		$44,000	0.3878	$17,063
15 (3)	$0	$44,000	$25,000	$69,000	0.3624	$25,006
16	$0	$44,000		$44,000	0.3387	$14,903
17	$0	$44,000		$44,000	0.3166	$13,930
18	$0	$44,000		$44,000	0.2959	$13,020
19	$0	$44,000		$44,000	0.2765	$12,166
20 (1)	$0	$44,000	$50,000	$94,000	0.2584	$24,290
		Total Cost		**$1,711,000**		
	Total Net Present Worth					**$1,222,000**

Footnotes:
(1) The year 20 costs include costs for closure activities and reporting.
(2) Periodic costs include closure costs (see footnote 1) and the annual costs for Tasks 10 and 11.
(3) Task 10 is assumed to be discontinued after 10 years.

General Notes:
1. Present Net Worth (PNW) cost is based on a 7% discount rate.
2. A 20 year lifetime is assumed for this Alternative to provide cleanup and closure for the site.

MLN/mln/BAI/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (Alt 3)
2082402.01180101-MAD1

Table A-4
Feasibility Study Alternatives Cost Estimates
Alternative 3: Source Treatment and Off-Property
Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Cost Estimate Assumptions and Notes

Task Number	
1a	It is assumed that up to two new wells will be required to adequately monitor the groundwater plume over the groundwater management zone area.
1b	Two access agreements are assumed necessary for installation of these new wells. The costs for obtaining these agreements are a conservative estimate.
1c	Costs are based on a conservative estimate for time necessary for assembling necessary information for the submittals for establishing the GW Management Zone.
2a	Injection costs are based on an estimate for a series of 5 injections over 5 months supplied by Isotec in August 1999 for 18 injection points to a depth of 50 feet over the identified source area (near well W23B).
2b	Costs for the drilling of the injection points are based on drilling costs from similar projects.
2c	It is estimated that approximately 100 tons of drill cutting soils will require removal and disposal. Transportation costs are from local estimates for hauling to a landfill located approximately 20 miles away. These materials are assumed to be non-hazardous.
2d	Drill cutting disposal costs are based on an estimated from Winnebago Reclamation, Pagel Landfill for the disposal of non-hazardous soils.
2e	Performance sampling analytical costs are based on the monthly analysis for VOCs from 10 site wells (plus duplicate and blanks) to determine the performance of the treatment during the treatment period. This will then be followed by VOC analysis of these ten wells quarterly for the following year (3 quarters).
2f	Performance sampling labor is for a two-day sampling effort for each of the sampling events (8 total assumed, 5 monthly then 3 quarterly). Labor costs also include all equipment and transportation costs for these events.
3	Costs for the "moth balling" of the existing ISCA system are assumed and do not include removal of trenched piping or the building from the site.
4a	Costs are based on a conservative estimate of the expenses that may be incurred to place a deed restriction on the property that prohibits future groundwater use.
5	Engineering activities and design costs include all necessary design reports, submittals, permitting, and general regulatory agency contact for the implementation of this alternative. These costs are assumed at 15% of the total construction costs, as recommended through EPA guidance materials.
6	Construction management costs are based on providing oversight for the construction activities that are included as part of this alternative. These costs are assumed at 10% of the construction costs, as recommended through EPA guidance materials.
7	Project management costs include all necessary regulatory contact, invoicing, and general project tracking. These costs are assumed at 8% of the construction costs, as recommended through EPA guidance materials.
8a	Quarterly groundwater monitoring costs are for continuation of the current sampling and analysis (16 samples assumed, 2 days of sampling for one individual) of the existing on-property and off-property groundwater monitoring wells and quarterly reporting of these results. This quarterly monitoring would also be used for the performance monitoring of the source treatment activities on a quarterly basis.

Table A-4
Feasibility Study Alternatives Cost Estimates
Alternative 3: Source Treatment and Off-Property
Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
9a	GW management zone sampling and reporting costs include the necessary labor for sampling the 11 wells that are assumed included in this zone on an annual basis for VOCs and preparing one annual report summarizing these results. This GW management zone monitoring program may or may not include wells that are part of the quarterly groundwater monitoring program (Task 8).
9b	Annual Blackhawk Acres private well sampling costs are based on the current costs for annually sampling the groundwater for those residences with point-of-entry treatment systems.
10	The point-of-entry treatment systems are assumed to require approximately $1,000 of maintenance/inspections every 5 years. It is further assumed that these systems will not be maintained after year 10. Costs included for year 10 are for the removal of these units from the various residences.
11	Five year reviews are required according to the NCP. The costs for these reviews are based on an estimate of the amount of engineering time and reporting necessary for these reviews.
12	Annual project management costs are assumed at 8% of the annual costs, similar to task 6. These costs include necessary regulatory contact, client contact, progress reporting, and invoicing.

MLN/mln/vlr/KRG
N:\Jobs\208\2402\01\wp\tbl\95_Table A-4 revised.doc
2082402.01180101-MAD1

TABLE A-5

Feasibility Study Alternatives Cost Estimates
Alternative 3a: Source Treatment and Off-property
Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	CONSTRUCTION/CAPITAL COSTS				
1	**Additional Groundwater Monitoring Costs (GW Mgmt Zone)**				
a	Well Drilling Costs	150	VLF	$40	$6,000
b	Access Agreements for Wells	2	EA	$2,000	$4,000
c	Groundwater Management Zone Setup	1	LS	$20,000	$20,000
2	**Source Treatment**				
a	Injection Costs	1	LS	$340,000	$340,000
b	Injection Point Drilling Costs (18 wells at 50 VLF each)	900	VLF	$40	$36,000
c	Drill Cuttings Hauling to Landfill	100	TONS	$20	$2,000
d	Drill Cuttings Disposal	100	TONS	$26	$2,600
e	Performance Sampling Analytical Costs	104	EA	$90	$9,360
f	Performance Sampling Labor Costs	176	HRS	$100	$17,600
3	**Existing ISCA System Moth balling**	1	LS	$10,000	$10,000
4	**Off-Property Plumes Pump and Treat System**				
a	Construction mobilization and demobilization	1	LS	$7,100	$7,100
b	Groundwater extraction well drilling and installation	4	EA	$4,500	$18,000
c	Wellhead manholes	4	EA	$2,500	$10,000
d	Plumbing	2,400	LF	$85	$204,000
e	Pavement demolition and replacement for plumbing trenches	85	SQ YD	$50	$4,250
f	Utility crossings	12	EA	$2,000	$24,000
g	Conveyance piping access ports	10	EA	$2,000	$20,000
h	Plumbing from treatment building to outfall structure	1,500	LF	$85	$127,500
i	Outfall structure	1	EA	$10,000	$10,000
j	Treatment building	1	EA	$50,000	$50,000
k	Electric submersible pumps	4	EA	$2,500	$10,000
l	Forcemain centrifugal pump	1	EA	$12,000	$12,000
m	Transfer pump	1	EA	$1,200	$1,200
n	Diffused air strippers	3	EA	$60,000	$180,000
o	Transfer tanks	2	EA	$1,800	$3,600
p	Iron sequestering agent system	1	EA	$2,500	$2,500
q	Bag filter system	1	EA	$1,500	$1,500
r	Internal plumbing	1	LS	$35,000	$35,000
s	Electrical and Controls/Meters	1	LS	$45,000	$45,000
t	Electrical service to treatment building	1	LS	$6,000	$6,000
u	Startup/Shakedown	4	DAYS	$1,800	$7,200
	SUBTOTAL CONSTRUCTION/CAPITAL COSTS				**$1,227,000**
	CONTINGENCY (15%)			**$185,000**	
	SUBTOTAL				**$1,412,000**
	INSTITUTIONAL CONTROL COSTS				
5	**On-property GW Control**				
a	Deed Restriction	1	LS	$10,000	$10,000
6	**ENGINEERING ACTIVITIES AND DESIGN COSTS (12%)**	1	LS	$170,000	$170,000
7	**CONSTRUCTION MANAGEMENT COSTS (8%)**	1	LS	$113,000	$113,000
8	**PROJECT MANAGEMENT COSTS (6%)**	1	LS	$85,000	$85,000
	TOTAL IMPLEMENTATION COSTS				**$1,790,000**

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	ANNUAL O&M COSTS				
8	**Site Groundwater Monitoring & Performance Monitoring Costs**				
a	Quarterly GW Monitoring Sampling & Reporting Costs	4	EA	$7,000	$28,000
9	**Off-property Exposure Control**				
a	GW Management Zone, Well Sampling & Reporting	1	LS	$7,000	$7,000
b	Annual Blackhawk Acres Private Well Sampling Costs (analytical & labor)	1	LS	$5,000	$5,000
10	**Off-property plumes pump and treat system**				
a	Operational labor	156	HRS	$50	$7,800
b	Maintenance labor	156	HRS	$45	$7,020
c	Maintenance materials	1	LS	$5,000	$5,000
d	Electrical power	165,000	kW-Hrs	$0.10	$16,500
e	System monitoring (NPDES testing, analytical, etc.)	20	EA	$1,000	$20,000
f	Reporting	4	EA	$4,000	$16,000
11	**Existing Point-of-Entry Treatment System Maintenance Costs (every 5 years)** (3)	4	EA	$1,000	$4,000
12	**5 Year Review Costs**	1	LS	$25,000	$25,000
	SUBTOTAL ANNUAL COSTS (not including Tasks 11 and 12)				$112,320
13	**ANNUAL PROJECT MANAGEMENT (8%)**	1	LS	$9,000	$9,000
	TOTAL ANNUAL COSTS (not including Tasks 11 and 12)				**$122,000**

TABLE A-5

Feasibility Study Alternatives Cost Estimates
Alternative 3a: Source Treatment and Off-property
Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Year	Capitol/Construction Costs	O&M Costs	Periodic Costs (2)	Total Costs	7% PNW Factor	Present Net Worth
0	$1,790,000	$0	$0	$1,790,000	1	$1,790,000
1	$0	$122,000		$122,000	0.9346	$114,021
2	$0	$122,000		$122,000	0.8734	$106,555
3	$0	$122,000		$122,000	0.8163	$99,589
4	$0	$122,000		$122,000	0.7629	$93,074
5	$0	$122,000	$29,000	$151,000	0.7130	$107,663
6	$0	$122,000		$122,000	0.6663	$81,289
7	$0	$122,000		$122,000	0.6227	$75,969
8	$0	$122,000		$122,000	0.5820	$71,004
9	$0	$122,000		$122,000	0.5439	$66,356
10	$0	$122,000	$29,000	$151,000	0.5083	$76,753
11	$0	$122,000		$122,000	0.4751	$57,962
12	$0	$122,000		$122,000	0.4440	$54,168
13	$0	$122,000		$122,000	0.4150	$50,630
14	$0	$122,000		$122,000	0.3878	$47,312
15 (3)	$0	$122,000	$25,000	$147,000	0.3624	$53,273
16	$0	$122,000		$122,000	0.3387	$41,321
17	$0	$122,000		$122,000	0.3166	$38,625
18	$0	$122,000		$122,000	0.2959	$36,100
19	$0	$122,000		$122,000	0.2765	$33,733
20 (1)	$0	$122,000	$50,000	$172,000	0.2584	$44,445
		Total Cost		$4,363,000		
	Total Net Present Worth					$3,140,000

Footnotes:
(1) The year 20 costs include costs for closure activities and reporting.
(2) Periodic costs include closure costs (see footnote 1) and the annual costs for Tasks 13 and 14.
(3) Task 11 is assumed to be discontinued after 10 years.

General Notes:
1. Present Net Worth (PNW) cost is based on a 7% discount rate.
2. The lifetime assumed for this alternative is less than 20 years, however, a conservative 20 year timeframe is used these cost estimating purposes for the site.

MLN/las/BAI/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (Alt 3a)
2082402.01180101-MAD1

Table A-5
Feasibility Study Alternatives Cost Estimates
Alternative 3a: Source Treatment and Off-Property
Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Cost Estimate Assumptions and Notes

Task Number	
1a	It is assumed that up to two new wells will be required to adequately monitor the groundwater plume over the groundwater management zone area.
1b	Two access agreements are assumed necessary for installation of these new wells.
1c	Costs are based on an estimate for time necessary for assembling necessary information for the submittals for establishing the GW Management Zone.
2a	Injection costs are based on an estimate for a series of 5 injections over 5 months supplied by Isotec in August 1999 for 18 injection points to a depth of 50 feet over the identified source area (near well W23B).
2b	Costs for the drilling of the injection points are based on drilling costs from similar projects.
2c	It is estimated that approximately 100 tons of drill cutting soils will require removal and disposal. Transportation costs are from local estimates for hauling to a landfill located approximately 20 miles away. These materials are assumed to be non-hazardous.
2d	Drill cutting disposal costs are based on an estimated from Winnebago Reclamation, Pagel Landfill for the disposal of non-hazardous soils.
2e	Performance sampling analytical costs are based on the monthly analysis for VOCs from 10 site wells (plus duplicate and blanks) to determine the performance of the treatment during the treatment period. This will then be followed by VOC analysis of these ten wells quarterly for the following year (3 quarters).
2f	Performance sampling labor is for a two-day sampling effort for each of the sampling events (8 total assumed, 5 monthly then 3 quarterly). Labor costs also include all equipment and transportation costs for these events.
3	Costs for the "moth balling" of the existing ISCA system are assumed and do not include removal of trenched piping or the building from the site.
4a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
4b	Extraction well drilling costs are for the installation of the 4 extraction wells, based on costs incurred for the original ISCA system, with some additional costs due to the potential deeper depth of these wells.
4c	Wellhead manhole costs are for the installation of concrete access manholes around each extraction well.
4d	Plumbing costs include costs for tying each of the new extraction wells into a common header line and bringing the header line into the proposed remediation building. It is assumed that 2,400 linear feet of trenching (mostly through pavement), bedding, and piping will be necessary.
4e	It is estimated that approximately 85 square yards of pavement will require removal and replacement to facilitate the trenching of the individual extraction lines and header into the treatment building.
4f	It is assumed that 12 total utility crossings will be necessary for pipe trenches.
4g	It is assumed that 10 total pipe access ports will be necessary, at each corner and approximately midway along each conveyance leg.
4h	Plumbing from the treatment building to the Rock River discharge point (outfall) is assumed at approximately 1,500 LF and includes costs for clearing, trenching, pipe bedding, piping, and backfilling along this route. It assumes trenching may be through asphalt and that the treatment building is located midway between the 4 proposed extraction wells.
4i	A specialized concrete outfall structure is assumed necessary to prevent riverbank erosion.
4j	A 400 square foot treatment building, with a 10 ft. roof and built of concrete masonry is assumed to be used. All necessary building controls and utilities are included in this task cost.

Table A-5
Feasibility Study Alternatives Cost Estimates
Alternative 3a: Source Treatment and Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
4k	3 hp electric submersible pumps are assumed necessary for each extraction well. Costs are based on current manufacturer estimates.
4l	A 10 hp centrifugal pump is assumed necessary for the conveyance header line to the treatment building. Costs are based on current manufacturer estimates.
4m	A small ½ hp transfer pump is assumed necessary to provide additional head to the water prior to its air stripping.
4n	3 separate air strippers are assumed necessary to completely handle the anticipated total volume of flow (200 gpm) . These units are similar in design to the units installed on the ISCA system. Costs are based on incurred costs for the ISCA strippers.
4o	Transfer tanks are assumed necessary to provide a constant non-varying flow of water to the air stripper units. Costs for these tanks are based on manufacturer estimates.
4p	An iron sequestering agent system is assumed necessary to prevent the clogging of the air stripper units. Costs for this system are based on manufacturer estimates.
4q	A bag filter system is assumed necessary to prevent the clogging of the air stripper units. Costs for this system are based on manufacturer estimates.
4r	Various internal plumbing in the treatment building will be necessary, including gauges, piping, and valves.
4s	Various electrical connection and controls/meters are included in this task. The controls include PLC controls and programming.
4t	The cost for this task is based on an estimate to extend a new electrical service and meter to the proposed treatment building.
4u	Startup/shakedown costs assume that 4 days will be necessary to complete this task and include all necessary testing and equipment.
5a	Costs are based on a conservative estimate of the expenses that may be incurred to place a deed restriction on the property that prohibits future groundwater use.
6	Engineering activities and design costs include all necessary design reports, submittals, permitting, and general regulatory agency contact for the implementation of this alternative. These costs are assumed at 12% of the total construction costs, as recommended through EPA guidance materials.
7	Construction management costs are based on providing oversight for the construction activities that are included as part of this alternative. These costs are assumed at 8% of the construction costs, as recommended through EPA guidance materials.
8	Project management costs include all necessary regulatory contact, invoicing, and general project tracking. These costs are assumed at 6% of the construction costs, as recommended through EPA guidance materials.
9a	Quarterly groundwater monitoring costs are for continuation of the current sampling and analysis (16 samples assumed, 2 days of sampling for one individual) of the existing on-property and off-property groundwater monitoring wells and quarterly reporting of these results. This quarterly monitoring would also be used for the performance monitoring of the source treatment activities on a quarterly basis.

Table A-5
Feasibility Study Alternatives Cost Estimates
Alternative 3a: Source Treatment and Off-Property Groundwater Plumes Pump and Treat

Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
10a	GW management zone sampling and reporting costs include the necessary labor for sampling the 11 wells that are assumed included in this zone on an annual basis for VOCs and preparing one annual report summarizing these results. This GW management zone monitoring program may or may not include wells that are part of the quarterly groundwater monitoring program (Task 9).
10b	Annual Blackhawk Acres private well sampling costs are based on the current costs for annually sampling the groundwater for those residences with point-of-entry treatment systems.
11a	Operational labor costs are for the labor necessary to insure that the off-site pump and treat system is maintained and operated continuously throughout the year.
11b	Maintenance labor costs are assumed based on an estimate of the amount of labor necessary to maintain the system in proper working condition.
11c	Maintenance materials include various equipment, chemicals, and other costs for the operation of the system.
11d	Electrical costs are based on the necessary electrical requirements for the various pumps and air stripper blowers.
11e	System monitoring costs include monthly discharge monitoring analyses and labor, quarterly system performance analyses, and other various monitoring activities (20 assumed events/samples).
11f	Reporting costs are for the quarterly reporting of the system operation and monitoring activities.
12	The point-of-entry treatment systems are assumed to require approximately $1,000 of maintenance/inspections every 5 years. It is further assumed that these systems will not be maintained after year 10. Costs included for year 10 are for the removal of these units from the various residences.
13	Five year reviews are required according to the NCP. The costs for these reviews are based on a conservative estimate of the amount of engineering time and reporting necessary for these reviews.
14	Annual project management costs are assumed at 8% of the annual costs. These costs include necessary regulatory contact, client contact, progress reporting, and invoicing.

MLN/mln/vlr/KRG
N:\Jobs\208\2402\01\wp\tbl\95_Table A-5 revised.doc
2082402.01180101-MAD1

TABLE A-6

Feasibility Study Alternatives Cost Estimates
Alternative 4: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	CONSTRUCTION/CAPITAL COSTS				
1	**Additional Groundwater Monitoring Costs (GW Mgmt Zone)**				
a	Well Drilling Costs	150	VLF	$40	$6,000
b	Access Agreements for Wells	2	EA	$2,000	$4,000
c	Groundwater Management Zone Setup	1	LS	$20,000	$20,000
2	**Source Treatment**				
a	Injection Costs	1	LS	$340,000	$340,000
b	Injection Point Drilling Costs (18 wells at 50 VLF each)	900	VLF	$40	$36,000
c	Drill Cuttings Hauling to Landfill	100	TONS	$20	$2,000
d	Drill Cuttings Disposal	100	TONS	$26	$2,600
e	Performance Sampling Analytical Costs	104	EA	$90	$9,360
f	Performance Sampling Labor Costs	176	HRS	$100	$17,600
3	**ISCA Extension into Blackhawk Acres Subdivision**				
a	Construction Mobilization/Demobilization	1	LS	$5,000	$5,000
b	Additional Groundwater Extraction Well	1	EA	$4,000	$4,000
c	3"/6" double wall HDPE conveyance pipe from new extraction well	2,300	FT	$85	$195,500
	to treatment building, including trenching, bedding, and backfilling				
d	Piping access ports/manholes	3	EA	$2,000	$6,000
e	Additional electric submersible pump	1	EA	$2,500	$2,500
f	Additional electrical requirements - wiring of pumps	1	LS	$5,000	$5,000
g	Additional plumbing requirements	1	LS	$3,000	$3,000
h	Additional process control modifications	1	LS	$3,000	$3,000
i	Access Agreements for new extraction well and piping	3	EA	$5,000	$15,000
j	Startup/shakedown	3	DAYS	$1,500	$4,500
k	Discharge permit modifications	1	LS	$3,000	$3,000
	SUBTOTAL CONSTRUCTION/CAPITAL COSTS				**$685,000**
	CONTINGENCY (15%)			**$103,000**	
	SUBTOTAL				**$788,000**
	INSTITUTIONAL CONTROL COSTS				
4	**On-property GW Control**				
a	Deed Restriction	1	LS	$10,000	$10,000
5	**ENGINEERING ACTIVITIES AND DESIGN COSTS (15%)**	1	LS	$119,000	$119,000
6	**CONSTRUCTION MANAGEMENT COSTS (10%)**	1	LS	$79,000	$79,000
7	**PROJECT MANAGEMENT COSTS (8%)**	1	LS	$64,000	$64,000
	TOTAL IMPLEMENTATION COSTS				**$1,060,000**

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	ANNUAL O&M COSTS				
8	**Performance Monitoring Costs (analytical & labor) - Years 1 - 5 only**				
a	Analytical Sampling Costs	36	EA	$100	$3,600
b	Sampling Labor Costs	48	HRS	$100	$4,800
c	Reporting Costs	70	HRS	$90	$6,300
9	**On-property GW Control**				
a	ISCA Operation & Maintenance Labor Costs	1	LS	$15,000	$15,000
b	ISCA Monitoring Costs (remote)	1	LS	$10,000	$10,000
c	Discharge Monitoring	12	EA	$800	$9,600
d1	Quarterly GW Monitoring Sampling & Reporting Costs (years 6-15)	4	EA	$7,000	$28,000
d2	Quarterly GW Monitoring Sampling & Reporting Costs (years 1-5)	2	EA	$7,000	$14,000
e	Annual ISCA Electrical Costs	50,000	kW-Hrs	$0.10	$5,000
f	Periodic maintenance/repair costs (every 5 years)	1	LS	$7,500	$7,500
10	**Off-property Exposure Control**				
a	GW Management Zone, Well Sampling & Reporting	1	LS	$7,000	$7,000
b	Annual Blackhawk Acres Private Well Sampling Costs (analytical & labor)	1	LS	$5,000	$5,000
11	**Existing Point-of-Entry Treatment System Maintenance Costs (every 5 years)**	4	EA	$1,000	$4,000
12	**5 Year Review Costs**	1	LS	$25,000	$25,000
	SUBTOTAL ANNUAL COSTS YEARS 1 - 5 (not including Tasks 9d1, 9f, 11, and 12)				$80,300
	SUBTOTAL ANNUAL COSTS YEARS 6 - 15 (not including Tasks 9d2, 9f, 11, and 12)				$79,600
13	**ANNUAL PROJECT MANAGEMENT (8%)**	1	LS	$7,000	$7,000
	TOTAL ANNUAL COSTS YEARS 1 - 5 (not including Tasks 9d1, 9f, 11, and 12)				**$88,000**
	TOTAL ANNUAL COSTS YEARS 6 - 15 (not including Tasks 9d2, 9f, 11, and 12)				**$86,600**

TABLE A-6

Feasibility Study Alternatives Cost Estimates
Alternative 4: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Year	Capitol/Construction Costs	O&M Costs	Periodic Costs (2)	Total Costs	7% PNW Factor	Present Net Worth
0	$1,060,000	$0	$0	$1,060,000	1	$1,060,000
1	$0	$88,000		$88,000	0.9346	$82,245
2	$0	$88,000		$88,000	0.8734	$76,859
3	$0	$88,000		$88,000	0.8163	$71,834
4	$0	$88,000		$88,000	0.7629	$67,135
5	$0	$88,000	$36,500	$124,500	0.7130	$88,769
6	$0	$86,600		$86,600	0.6663	$57,702
7	$0	$86,600		$86,600	0.6227	$53,926
8	$0	$86,600		$86,600	0.5820	$50,401
9	$0	$86,600		$86,600	0.5439	$47,102
10	$0	$86,600	$36,500	$123,100	0.5083	$62,572
11	$0	$86,600		$86,600	0.4751	$41,144
12	$0	$86,600		$86,600	0.4440	$38,450
13	$0	$86,600		$86,600	0.4150	$35,939
14	$0	$86,600		$86,600	0.3878	$33,583
15 (1)	$0	$86,600	$50,000	$136,600	0.3624	$49,504
		Total Cost		**$2,489,000**		
	Total Net Present Worth					**$1,918,000**

Footnotes:
(1) The year 15 costs include costs for closure activities and reporting.
(2) Periodic costs include closure costs (see footnote 1) and the annual costs for Tasks 9f, 11, and 12.

General Notes:
1. Present Net Worth (PNW) cost is based on a 7% discount rate.
2. A 15 year lifetime is assumed for this Alternative to provide cleanup and closure for the site.

MLN/mln/BAI/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (Alt 4)
2082402.01180101-MAD1

Table A-6
Feasibility Study Alternatives Cost Estimates
Alternative 4: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Exposure Control

Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Cost Estimate Assumptions and Notes

Task Number	
1a	It is assumed that up to two new wells will be required to adequately monitor the groundwater plume over the groundwater management zone area.
1b	Two access agreements are assumed necessary for installation of these new wells.
1c	Costs are based on an estimate for time necessary for assembling necessary information for the submittals for establishing the GW Management Zone.
2a	Injection costs are based on an estimate for a series of 5 injections over 5 months supplied by Isotec in August 1999 for 18 injection points to a depth of 50 feet over the identified source area (near well W23B).
2b	Costs for the drilling of the injection points are based on drilling costs from similar projects.
2c	It is estimated that approximately 100 tons of drill cutting soils will require removal and disposal. Transportation costs are from local estimates for hauling to a landfill located approximately 20 miles away. These materials are assumed to be non-hazardous.
2d	Drill cutting disposal costs are based on an estimated from Winnebago Reclamation, Pagel Landfill for the disposal of non-hazardous soils.
2e	Performance sampling analytical costs are based on the monthly analysis for VOCs from 10 site wells (plus duplicate and blanks) to determine the performance of the treatment during the treatment period. This will then be followed by VOC analysis of these ten wells quarterly for the following year (3 quarters).
2f	Performance sampling labor is for a two-day sampling effort for each of the sampling events (8 total assumed, 5 monthly then 3 quarterly). Labor costs also include all equipment and transportation costs for these events.
3a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
3b	One new extraction well is assumed necessary for the extension of the ISCA treatment system. This well is assumed to be located next to monitoring well W44C.
3c	Plumbing is identical to plumbing type used in existing system. Costs are based on costs for the existing system including additional costs for trenching in the pavement and repair and crossing the railroad line and repair.
3d	Access ports are assumed to be installed at the corners of the plumbing from the extraction well to the treatment building and midway along each leg, at a cost of approximately $2,000 each, the same as incurred for the installation of the existing ISCA.
3e	This additional submersible pump is assumed to be similar to original ISCA submersible pumps in cost and is the same type of design/make as used in the existing ISCA extraction wells.
3f	Additional electrical requirements include the extension of electrical power through the plumbing trench to the new extraction well and submersible pump. Costs are a conservative estimate, based on similar projects.
3g	Additional plumbing requirements are for the various plumbing, valves, and connections required to bring the new extraction line into the existing building and tie it into the treatment system.
3h	Additional process control modification costs include costs for the interfacing of the new extraction well into the existing control system and reprogramming of the PLC system.
3i	It is assumed that three separate access agreements will be necessary for the new extraction well and trenching of the extraction line to the existing treatment system.
3j	Startup/shakedown costs are based on three days of engineering time necessary to test and bring the system into full operation.
3k	Modifications or resubmittal of the existing discharge permit will be necessary following the expansion of the ISCA system.

Table A-6
Feasibility Study Alternatives Cost Estimates
Alternative 4: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Exposure Control

Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
4a	Costs are based on a conservative estimate of the expenses that may be incurred to place a deed restriction on the property that prohibits future groundwater use.
5	Engineering activities and design costs include all necessary design reports, submittals, permitting, and general regulatory agency contact for the implementation of this alternative. These costs are assumed at 15% of the total construction costs, as recommended through EPA guidance materials.
6	Construction management costs are based on providing oversight for the construction activities that are included as part of this alternative. These costs are assumed at 10% of the construction costs, as recommended through EPA guidance materials.
7	Project management costs include all necessary regulatory contact, invoicing, and general project tracking. These costs are assumed at 8% of the construction costs, as recommended through EPA guidance materials.
8a	Annual performance monitoring costs for the source treatment activities are based on an assumed sampling frequency of semi-annually for the ten on-site wells (plus duplicates and blanks) for VOCs. It is assumed that these events will only be conducted through year 5.
8b	Annual performance monitoring costs for labor are based on semi-annual sampling events taking 1 individual two days to sample the ten on-site wells. It is assumed that these events will only be conducted through year 5.
8c	Reporting costs are based on assembling only annual reports that summarize the performance monitoring activities.
9a	Annual ISCA operation and maintenance costs are based on the current expenses for labor to operate this system. The potential expansion of the system into the Blackhawk Acres subdivision (one new extraction well) would be expected to only add marginal costs for the system operations and monitoring.
9b	Annual ISCA monitoring costs are for the daily PLC monitoring of the system via modem and recording system operational information.
9c	Discharge monitoring costs are for the sampling and analysis of the required monthly system effluent.
9d	Quarterly groundwater monitoring costs are for continuation of the current sampling and analysis (16 samples assumed; 1 additional for the potential new ISCA extraction well) of the existing on-property and off-property groundwater monitoring wells and quarterly reporting of these results. This quarterly report would also include results from the operation of the ISCA system (same as existing report). Only 2 quarters are necessary during years 1-5 due to performance monitoring that will be conducted as a result of the source treatment action.
9e	Annual ISCA electrical costs are based on the annual electrical use of the existing ISCA system and an additional 10,000 kW for the new extraction well and transfer pump.
9f	Periodic (every 5 years assumed) maintenance costs are included to cover the replacement/repair of pumps, valves, blowers, etc. as necessary for the ISCA system.
10a	GW management zone sampling and reporting costs include the necessary labor for sampling the 11 wells that are assumed included in this zone on an annual basis for VOCs and preparing one annual report summarizing these results. This GW management zone monitoring program may or may not include wells that are part of the quarterly groundwater monitoring program (Task 9d).
10b	Annual Blackhawk Acres private well sampling costs are based on the current costs for annually sampling the groundwater for those residences with point-of-entry treatment systems.

Table A-6
Feasibility Study Alternatives Cost Estimates
Alternative 4: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Exposure Control
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
11	The point-of-entry treatment systems are assumed to require approximately $1,000 of maintenance/inspections every 5 years. It is further assumed that these systems will not be maintained after year 10. Costs included for year 10 are for the removal of these units from the various residences.
12	Five year reviews are required according to the NCP. The costs for these reviews are based on a conservative estimate of the amount of engineering time and reporting necessary for these reviews.
13	Annual project management costs are assumed at 8% of the annual costs. These costs include necessary regulatory contact, client contact, progress reporting, and invoicing.

MLN/mln/vlr/KRG
N:\Jobs\208\2402\01\wp\tbl\95_Table A-6 revised.doc
2082402.01180101-MAD1

TABLE A-7

Feasibility Study Alternatives Cost Estimates
Alternative 4a: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	CONSTRUCTION/CAPITAL COSTS				
1	**Additional Groundwater Monitoring Costs (GW Mgmt Zone)**				
a	Well Drilling Costs	150	VLF	$40	$6,000
b	Access Agreements for Wells	2	EA	$2,000	$4,000
c	Groundwater Management Zone Setup	1	LS	$20,000	$20,000
2	**Source Treatment**				
a	Injection Costs	1	LS	$340,000	$340,000
b	Well Drilling Costs (18 wells at 50 VLF each)	900	VLF	$40	$36,000
c	Drill Cuttings Hauling to Landfill	100	TONS	$20	$2,000
d	Drill Cuttings Disposal	100	TONS	$26	$2,600
e	Performance Sampling Analytical Costs	104	EA	$90	$9,360
f	Performance Sampling Labor Costs	176	HRS	$100	$17,600
3	**ISCA Extension into Blackhawk Acres Subdivision**				
a	Construction Mobilization/Demobilization	1	LS	$5,000	$5,000
b	Additional Groundwater Extraction Well	1	EA	$4,000	$4,000
c	3"/6" double wall HDPE conveyance pipe from new extraction well	2,300	FT	$85	$195,500
	to treatment building, including trenching, bedding, and backfilling				
d	Piping access ports/manholes	3	EA	$2,000	$6,000
e	Additional electric submersible pump	1	EA	$2,500	$2,500
f	Additional electrical requirements - wiring of pumps	1	LS	$5,000	$5,000
g	Additional plumbing requirements	1	LS	$3,000	$3,000
h	Additional process control modifications	1	LS	$3,000	$3,000
i	Access Agreements for new extraction well and piping	3	EA	$5,000	$15,000
j	Startup/shakedown	3	DAYS	$1,500	$4,500
k	Discharge permit modifications	1	LS	$3,000	$3,000
4	**Off-Property Plumes Pump and Treat System**				
a	Construction mobilization and demobilization	1	LS	$7,100	$7,100
b	Groundwater extraction well drilling and installation	4	EA	$4,500	$18,000
c	Wellhead manholes	4	EA	$2,500	$10,000
d	Plumbing	2,400	LF	$85	$204,000
e	Pavement demolition and replacement for plumbing trenches	85	SQ YD	$50	$4,250
f	Utility crossings	12	EA	$2,000	$24,000
g	Conveyance piping access ports	10	EA	$2,000	$20,000
h	Plumbing from treatment building to outfall structure	1,500	LF	$85	$127,500
i	Outfall structure	1	EA	$10,000	$10,000
j	Treatment building	1	EA	$50,000	$50,000
k	Electric submersible pumps	4	EA	$2,500	$10,000
l	Forcemain centrifugal pump	1	EA	$12,000	$12,000
m	Transfer pump	1	EA	$1,200	$1,200
n	Diffused air strippers	3	EA	$60,000	$180,000
o	Transfer tanks	2	EA	$1,800	$3,600
p	Iron sequestering agent system	1	EA	$2,500	$2,500
q	Bag filter system	1	EA	$1,500	$1,500
r	Internal plumbing	1	LS	$35,000	$35,000
r	Electrical and Controls/Meters	1	LS	$45,000	$45,000
s	Electrical service to treatment building	1	LS	$6,000	$6,000
t	Startup/Shakedown	4	DAYS	$1,800	$7,200
	SUBTOTAL CONSTRUCTION/CAPITAL COSTS				**$1,463,000**
	CONTINGENCY (15%)			**$220,000**	
	SUBTOTAL				**$1,683,000**
	INSTITUTIONAL CONTROL COSTS				
5	**On-property GW Control**				
a	Deed Restriction	1	LS	$10,000	$10,000
6	**ENGINEERING ACTIVITIES AND DESIGN COSTS (12%)**	1	LS	**$202,000**	$202,000
7	**CONSTRUCTION MANAGEMENT COSTS (8%)**	1	LS	$135,000	$135,000
8	**PROJECT MANAGEMENT COSTS (6%)**	1	LS	$101,000	$101,000
	TOTAL IMPLEMENTATION COSTS				**$2,131,000**

TABLE A-7

Feasibility Study Alternatives Cost Estimates
Alternative 4a: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	Task	Quantity	Unit	Unit Price	Extended Price
	ANNUAL O&M COSTS				
9	**Performance Monitoring Costs (analytical & labor) - Years 1 - 5 only**				
a	Analytical Sampling Costs	36	EA	$100	$3,600
b	Sampling Labor Costs	48	HRS	$100	$4,800
c	Reporting Costs	70	HRS	$90	$6,300
10	**On-property GW Control**				
a	ISCA Operation & Maintenance Labor Costs	1	LS	$15,000	$15,000
b	ISCA Monitoring Costs (remote)	1	LS	$10,000	$10,000
c	Discharge Monitoring	12	EA	$800	$9,600
d1	Quarterly GW Monitoring Sampling & Reporting Costs	4	EA	$7,000	$28,000
d2	Quarterly GW Monitoring Sampling & Reporting Costs	2	EA	$7,000	$14,000
e	Annual ISCA Electrical Costs	50,000	kW-Hrs	$0.10	$5,000
f	Periodic maintenance/repair costs (every 5 years)	1	LS	$7,500	$7,500
11	**Off-property plumes pump and treat system**				
a	Operational labor	156	HRS	$50	$7,800
b	Maintenance labor	156	HRS	$45	$7,020
c	Maintenance materials	1	LS	$5,000	$5,000
d	Electrical power	165,000	kW-Hrs	$0.10	$16,500
e	System monitoring (NPDES testing, analytical, etc.)	20	EA	$1,000	$20,000
f	Reporting	4	EA	$4,000	$16,000
12	**Off-property Exposure Control**				
a	GW Management Zone, Well Sampling & Reporting	1	LS	$7,000	$7,000
b	Annual Blackhawk Acres Private Well Sampling Costs (analytical & labor)	1	LS	$5,000	$5,000
13	**Existing Point-of-Entry Treatment System Maintenance Costs (every 5 years)**	4	EA	$1,000	$4,000
14	**5 Year Review Costs**	1	LS	$25,000	$25,000
	SUBTOTAL ANNUAL COSTS YEARS 1 - 5 (not including Tasks 10d1, 10f, 13, and 14)				$152,620
	SUBTOTAL ANNUAL COSTS YEARS 6 - 15 (not including Tasks 10d2, 10f, 13, and 14)				$151,920
15	**ANNUAL PROJECT MANAGEMENT (8%)**	1	LS	$13,000	$13,000
	TOTAL ANNUAL COSTS YEARS 1 - 5 (not including Tasks 10d1, 10f, 13, and 14)				**$165,620**
	TOTAL ANNUAL COSTS YEARS 6 - 15 (not including Tasks 10d2, 10f, 13, and 14)				**$164,920**

Year	Capitol/Construction Costs	O&M Costs	Periodic Costs (2)	Total Costs	7% PNW Factor	Present Net Worth
0	$2,131,000	$0	$0	$2,131,000	1	$2,131,000
1	$0	$165,620		$165,620	0.9346	$154,788
2	$0	$165,620		$165,620	0.8734	$144,653
3	$0	$165,620		$165,620	0.8163	$135,196
4	$0	$165,620		$165,620	0.7629	$126,351
5	$0	$165,620	$36,500	$202,120	0.7130	$144,112
6	$0	$164,920		$164,920	0.6663	$109,886
7	$0	$164,920		$164,920	0.6227	$102,696
8	$0	$164,920		$164,920	0.5820	$95,983
9	$0	$164,920		$164,920	0.5439	$89,700
10	$0	$164,920	$36,500	$201,420	0.5083	$102,382
11	$0	$164,920		$164,920	0.4751	$78,353
12	$0	$164,920		$164,920	0.4440	$73,224
13	$0	$164,920		$164,920	0.4150	$68,442
14	$0	$164,920		$164,920	0.3878	$63,956
15 (1)	$0	$164,920	$50,000	$214,920	0.3624	$77,887
		Total Cost		**$4,732,000**		
	Total Net Present Worth					**$3,699,000**

Footnotes:
(1) The year 15 costs include costs for closure activities and reporting.

General Notes:
1. Present Net Worth (PNW) cost is based on a 7% discount rate.
2. A 15 year lifetime is assumed for this Alternative to provide cleanup and closure for the site.

MLN/las/BAI/KRG
n:\jobs\208\2402\01\wp\tbl\FS cost tables revised.xls (Alt 4a)
2082402.01180101-MAD1

Table A-7
Feasibility Study Alternatives Cost Estimates
Alternative 4a: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Pump and Treat

Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Cost Estimate Assumptions and Notes

Task Number	
1a	It is assumed that up to two new wells will be required to adequately monitor the groundwater plume over the groundwater management zone area.
1b	Two access agreements are assumed necessary for installation of these new wells.
1c	Costs are based on an estimate for time necessary for assembling necessary information for the submittals for establishing the GW Management Zone.
2a	Injection costs are based on an estimate for a series of 5 injections over 5 months supplied by Isotec in August 1999 for 18 injection points to a depth of 50 feet over the identified source area (near well W23B).
2b	Costs for the drilling of the injection points are based on drilling costs from similar projects.
2c	It is estimated that approximately 100 tons of drill cutting soils will require removal and disposal. Transportation costs are from local estimates for hauling to a landfill located approximately 20 miles away. These materials are assumed to be non-hazardous.
2d	Drill cutting disposal costs are based on an estimated from Winnebago Reclamation, Pagel Landfill for the disposal of non-hazardous soils.
2e	Performance sampling analytical costs are based on the monthly analysis for VOCs from 10 site wells (plus duplicate and blanks) to determine the performance of the treatment during the treatment period. This will then be followed by VOC analysis of these ten wells quarterly for the following year (3 quarters).
2f	Performance sampling labor is for a two-day sampling effort for each of the sampling events (8 total assumed, 5 monthly then 3 quarterly). Labor costs also include all equipment and transportation costs for these events.
3a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
3b	One new extraction well is assumed necessary for the extension of the ISCA treatment system. This well is assumed to be located next to monitoring well W44C.
3c	Plumbing is identical to plumbing type used in existing system. Costs are based on costs for the existing system including additional costs for trenching in the pavement and repair and crossing the railroad line and repair.
3d	Access ports are assumed to be installed at the corners of the plumbing from the extraction well to the treatment building and midway along each leg, at a cost of approximately $2,000 each, the same as incurred for the installation of the existing ISCA.
3e	This additional submersible pump is assumed to be similar to the original ISCA submersible pumps in cost and is the same type of design/make as used in the existing ISCA extraction wells.
3f	Additional electrical requirements include the extension of electrical power through the plumbing trench to the new extraction well and submersible pump. Costs are a conservative estimate, based on similar projects.
3g	Additional plumbing requirements are for the various plumbing, valves, and connections required to bring the new extraction line into the existing building and tie it into the treatment system.
3h	Additional process control modification costs include costs for the interfacing of the new extraction well into the existing control system and reprogramming of the PLC system.
3i	It is assumed that three separate access agreements will be necessary for the new extraction well and trenching of the extraction line to the existing treatment system.
3j	Startup/shakedown costs are based on three days of engineering time necessary to test and bring the system into full operation.
3k	Modifications or resubmittal of the existing discharge permit will be necessary following the expansion of the ISCA system.

Table A-7
Feasibility Study Alternatives Cost Estimates
Alternative 4a: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
4a	Estimated costs based on similar projects and the costs incurred for the initial construction of the ISCA treatment system.
4b	Extraction well drilling costs are for the installation of the 4 potential extraction wells, based on costs incurred for the original ISCA system, with some additional costs due to the potential deeper depth of these wells.
4c	Wellhead manhole costs are for the installation of concrete access manholes around each extraction well.
4d	Plumbing costs include costs for tying each of the new extraction wells into a common header line and bringing the header line into the proposed remediation building. It is assumed that 2,400 linear feet of trenching (mostly through pavement), bedding, and piping will be necessary.
4e	It is estimated that approximately 85 square yards of pavement will require removal and replacement to facilitate the trenching of the individual extraction lines and header into the treatment building.
4f	It is assumed that 12 total utility crossings will be necessary for pipe trenches.
4g	It is assumed that 10 total pipe access ports will be necessary, at each corner and approximately midway along each conveyance leg.
4h	Plumbing from the treatment building to the Rock River discharge point (outfall) is assumed at approximately 1,500 LF and includes costs for clearing, trenching, pipe bedding, piping, and backfilling along this route. It assumes trenching may be through asphalt and that the treatment building is located midway between the 4 proposed extraction wells.
4i	A specialized concrete outfall structure is assumed necessary to prevent riverbank erosion.
4j	A 400 square foot treatment building, with a 10 ft. roof and built of concrete masonry is assumed to be used. All necessary building controls and utilities are included in this task cost.
4k	3 hp electric submersible pumps are assumed necessary for each extraction well. Costs are based on current manufacturer estimates.
4l	A 10 hp centrifugal pump is assumed necessary for the conveyance header line to the treatment building. Costs are based on current manufacturer estimates.
4m	A small ½ hp transfer pump is assumed necessary to provide additional head to the water prior to its air stripping.
4n	3 separate air strippers are assumed necessary to completely handle the anticipated total volume of flow (200 gpm) . These units are similar in design to the units installed on the ISCA system. Costs are based on incurred costs for the ISCA strippers.
4o	Transfer tanks are assumed necessary to provide a constant non-varying flow of water to the air stripper units. Costs for these tanks are based on manufacturer estimates.
4p	An iron sequestering agent system is assumed necessary to prevent the clogging of the air stripper units. Costs for this system are based on manufacturer estimates.
4q	A bag filter system is assumed necessary to prevent the clogging of the air stripper units. Costs for this system are based on manufacturer estimates.
4r	Various internal plumbing in the treatment building will be necessary, including gauges, piping, and valves. A conservative estimate was used for these costs.
4s	Various electrical connection and controls/meters are included in this task. The controls include PLC controls and programming.
4t	The cost for this task is based on a conservative estimate to extend a new electrical service and meter to the proposed treatment building.
4u	Startup/shakedown costs assume that 4 days will be necessary to complete this task and include all necessary testing and equipment.

Table A-7
Feasibility Study Alternatives Cost Estimates
Alternative 4a: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
5a	Costs are based on a conservative estimate of the expenses that may be incurred to place a deed restriction on the property that prohibits future groundwater use.
6	Engineering activities and design costs include all necessary design reports, submittals, permitting, and general regulatory agency contact for the implementation of this alternative. These costs are assumed at 12% of the total construction costs, as recommended through EPA guidance materials.
7	Construction management costs are based on providing oversight for the construction activities that are included as part of this alternative. These costs are assumed at 8% of the construction costs, as recommended through EPA guidance materials.
8	Project management costs include all necessary regulatory contact, invoicing, and general project tracking. These costs are assumed at 6% of the construction costs, as recommended through EPA guidance materials.
9a	Annual performance monitoring costs for the source treatment activities are based on an assumed sampling frequency of semi-annually for the ten on-site wells (plus duplicates and blanks) for VOCs. It is assumed that these events will only be conducted through year 5.
9b	Annual performance monitoring costs for labor are based on semi-annual sampling events taking 1 individual two days to sample the ten on-site wells. It is assumed that these events will only be conducted through year 5.
9c	Reporting costs are based on assembling only annual reports that summarize the performance monitoring activities.
10a	Annual ISCA operation and maintenance costs are based on the current expenses for labor to operate this system. The potential expansion of the system into the Blackhawk Acres subdivision (one new extraction well) would be expected to only add marginal costs for the system operations and monitoring.
10b	Annual ISCA monitoring costs are for the daily PLC monitoring of the system via modem and recording system operational information.
10c	Discharge monitoring costs are for the sampling and analysis of the required monthly system effluent.
10d	Quarterly groundwater monitoring costs are for continuation of the current sampling and analysis (16 samples assumed; 1 additional for the potential new ISCA extraction well) of the existing on-property and off-property groundwater monitoring wells and quarterly reporting of these results. This quarterly report would also include results from the operation of the ISCA system (same as existing report). Only 2 quarters are necessary during years 1-5 due to performance monitoring that will be conducted as a result of the source treatment action.
10e	Annual ISCA electrical costs are based on the annual electrical use of the existing ISCA system and an additional 10,000 kW for the new extraction well and transfer pump.
10f	Periodic (every 5 years assumed) maintenance costs are included to cover the replacement/repair of pumps, valves, blowers, etc. as necessary for the ISCA system.

Table A-7
Feasibility Study Alternatives Cost Estimates
Alternative 4a: On-Property Groundwater Pump and Treat, Source Treatment, and Off-Property Groundwater Plumes Pump and Treat
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

Task Number	
11a	Operational labor costs are for the labor necessary to insure that the off-site pump and treat system is maintained and operated continuously throughout the year.
11b	Maintenance labor costs are assumed based on an estimate of the amount of labor necessary to maintain the system in proper working condition.
11c	Maintenance materials include various equipment, chemicals, and other costs for the operation of the system.
11d	Electrical costs are based on the necessary electrical requirements for the various pumps and air stripper blowers.
11e	System monitoring costs include monthly discharge monitoring analyses and labor, quarterly system performance analyses, and other various monitoring activities (20 assumed events/samples).
11f	Reporting costs are for the quarterly reporting of the system operation and monitoring activities.
12a	GW management zone sampling and reporting costs include the necessary labor for sampling the 11 wells that are assumed included in this zone on an annual basis for VOCs and preparing one annual report summarizing these results. This GW management zone monitoring program may or may not include wells that are part of the quarterly groundwater monitoring program (Task 10d).
12b	Annual Blackhawk Acres private well sampling costs are based on the current costs for annually sampling the groundwater for those residences with point-of-entry treatment systems.
13	The point-of-entry treatment systems are assumed to require approximately $1,000 of maintenance/inspections every 5 years. It is further assumed that these systems will not be maintained after year 10. Costs included for year 10 are for the removal of these units from the various residences.
14	Five year reviews are required according to the NCP. The costs for these reviews are based on an estimate of the amount of engineering time and reporting necessary for these reviews.
15	Annual project management costs are assumed at 8% of the annual costs. These costs include necessary regulatory contact, client contact, progress reporting, and invoicing.

MLN/mln/vlr/KRG
N:\Jobs\208\2402\01\wp\tbl\95_Table A-7 revised.doc
2082402.01180101-MAD1

B

SUMMARY OF FSDA NORM SURVEY

MEMORANDUM

MWH
MONTGOMERY WATSON HARZA

One Science Court
P.O. Box 5385
Madison, Wisconsin 53705-0385
Tel: (608) 231-4747
Fax: (608)231-4777

Date: August 3, 2001

To: Kenneth Quinn

From: Jeff Ramsby

Subject: Summary of FSDA NORM Survey (March 29, 2001)
Beloit Corporation, Rockton Facility NPL Site
Rockton, Illinois

On March 29, 2001 a survey was conducted at the Beloit Corporation, Rockton Facility (i.e., Blackhawk Facility) NPL Site to determine the level of naturally occurring radioactive materials (NORM) at the Foundry Sand Disposal Area (FSDA) at the above referenced facility. The survey was completed using a hollow stem auger (HAS) drilling rig to complete soil borings and collect the subsurface samples with a split spoon sampling device. Soils samples were collected continuously to the base of the boring. NORM in soils was measured using a Model 190-120 Victoreen survey and count meter equipped with a sodium iodide gamma scintillator optically coupled to a photomultiplier tube.

Initially, background surface NORM readings were measured in the vicinity between the storage yard area (SYA) and the Fibered Sludge Spreading Area (FSSA). Readings directly south of the SYA ranged from 5,500 to 6,000 counts per minute (cpm). Farther south towards the FSSA readings increased to between 7,500 and 8,000 cpm.

One background soil boring (B1) was conducted to the east of the FSDA, directly south of the SYA. This boring was completed to approximately 10 ft below ground surface (bgs) and NORM readings ranged from approximately 3,500 to 4,000 cpm.

Three borings (B2, B3, and B4) were completed within the footprint of the FSDA. Results are provided on Table B-1. One boring was conducted in the northern 1/3 of the footprint, one boring in the central area of the footprint, and one boring in the southern 1/3 of the footprint. Each boring was conducted until native soils were encountered at depths of approximately 14 ft (B2), and 16 ft (B3 and B4). At B2, the NORM reading ranged from between 2,500 to 4,000 cpm. At B3 and B4, NORM readings ranged from 2,500 to 3,500 cpm.

Borings completed for this NORM survey were backfilled using granular and chipped bentonite.

Summary

The results from this survey of the FSDA for NORM indicate that NORM is not present within the FSDA stockpile above background levels.

Attachments: Table B-1 – NORM Survey Results

RJR/rjr/KJQ
N:\Jobs\208\2402\01\wp\rpt\99_FS Appendix B.doc
2082402.01180101-MD

TABLE B-1
NORM Survey Results
Feasibility Study
Beloit Corporation, Rockton Facility
Rockton, Illinois

Sample Location	Description	Boring Depth	NORM Results (cpm) [1]
B1	background soil boring	10 ft.	3,500 - 4,000
B2	northern 1/3rd of FSDA	14 ft.	2,500 - 4,000
B3	central area of FSDA	16 ft.	2,500 - 3,500
B4	southern 1/3rd of FSDA	16 ft.	2,500 - 3,500

Notes:
(1) Results are given in the range of counts per minute (cpm), as detected using a Model 190-120 Victoreen survey and counte meter equipped with a sodium iodide gamma scintillator.
(2) FSDA = Foundry Sand Disposal Area
(3) NORM = naturally occurring radioactive material

MLN/mln/RJR
n:\jobs\208\2402\01\wp\tbl\FS_TABLE B-1.xls
2082402.01180101-MD

C

REMEDIAL TIME FRAME ANALYSIS

TABLE C-1
TOTAL VOC CONCENTRATION ANALYSES
Feasibility Study

Beloit Corporation - Rockton Facility NPL Site

Rockton, Illinois

		Total VOC Concentrations (ug/L)									
Samp Event	**Mo.'s from ISCA system startup**	**W41**	**W26C**	**G108D**	**W23**	**W23B**	**W47C**	**W48C**	**W38**	**W18**	**W43C**
Jul-96	0	39.8	111.5	1.0	2200	2010	99	37	910	21	144.4
Oct-96	3	15	84		1500	1348			710	15	
Jan-97	6	8.0	113		1403	1616			446	14	
Apr-97	9	4.0	87		2203	2293			224	16	
Jul-97	12	32	38	0	1800	1944		28	160	19	112
Oct-97	15	25	36		1800	2114			93	21	
Jan-98	18	4.0	28		1100	2830	137	16	42	19	78
Apr-98	21	32	24	14	1900	3318	194	22	29	25	51
Jul-98	24	7.5	18.6	17.3	2102.8	3105	34.5	23.6	25.3	21.7	96.4
Oct-98	27	25.3	19.5	3.5	2200	3600	134.5	13.1	21.7	18.9	97.6
Jan-99	30	14.9	24.5	1.1	1800	3700	124.5	9.7	19.6	19.4	77.3
Apr-99	33	13.5	31.5	2.0	1600	4460	134	27.9	14.6	23.2	79.8
Aug-99	36	4.1	37.1	1.5	1700	3140	94.5	14.2	20.9	16.8	84.5
Oct-99	39	18.2	43.2	0	1501.9	3431.1	88	6.7	22.4	16	94.5
Feb-00	42	2.6	28.4	0	1101.4	2540	82.7	2.6	16.2	13.3	50
Apr-00	45	1.3	27.5	0	980	1800	114	4.68	15.5	17.88	69.3
Jul-00	48	28.4	33.2	1.1	1000	4522	78	4.19	18.8	11.35	78.8
Oct-00	51	17	27.3	2.2	1200	3492.6	94.3	2.38	11.9	7.9	63
Jan-01	54	5.3	56.2	4.85	851.2	3230.8	123.55	3.69	20.1	11.92	38.2
Apr-01	57		31.8	5.1	820	2578.7	107.5	2.19	11	10	53.1
Jul-01	60	3.0	31.8	3.59	750	3120	84.9	2.66	13.8	8.7	51.4

	W41	W26C	G108D	W23	W23B	W47C	W48C	W38	W18	W43C
Slope (decay term)	-0.021	-0.0145		-0.0141	0.0099	-0.0026	-0.0531	-0.0658	-0.0111	-0.0149
Intercept (C_o)	18.617	60.493		2165.500	2028.100	111.970	55.466	304.700	22.035	123.92
R-square	0.1446	0.255		0.564	0.315	0.013	0.814	0.761	0.414	0.537
Time to Achieve 5 ug/L Total VOCs (years)	<5	<10	<5	<30	---	---	0	<5	<10	<15
Conc. at year 5 (132 months)	1.164	8.92		336.705	7492.477	79.442	0.050	0.051	5.091	17.337
Conc. at year 10 (192 months)	0.330	3.74		144.489	1.36E+04	67.968	0.002	0.001	2.615	7.091
Conc. at year 15 (252 months)	0.094	1.57		62.004	2.46E+04	58.150	8.56E-05	1.92E-05	1.344	2.900
Conc. at year 20 (312 months)	0.027	0.656		26.608	4.45E+04	49.751	3.54E-06	3.7E-07	0.690	1.186
Conc. at year 25 (372 months)	0.008	0.275		11.418	8.06E+04	42.565	1.46E-07	7.13E-09	0.355	0.485
Conc. at year 30 (432 months)	0.002	0.115		4.900	1.46E+05	36.417	6.05E-09	1.38E-10	0.182	0.198

Notes:

(1) The slope and intercept values are based on the first order decay (exponential) trendlines fit to each data set, as shown in the graphs included in Appendix C.

(2) For well G108D an exponential trendline could not be fit to the data, due to its variability.

(3) The ISCA treatment system was started in July 1996.

(4) The concentrations in each well are calculated assuming that FS remediation efforts will begin in July 2002, or 6 years (72 months) from the startup of the ISCA system.

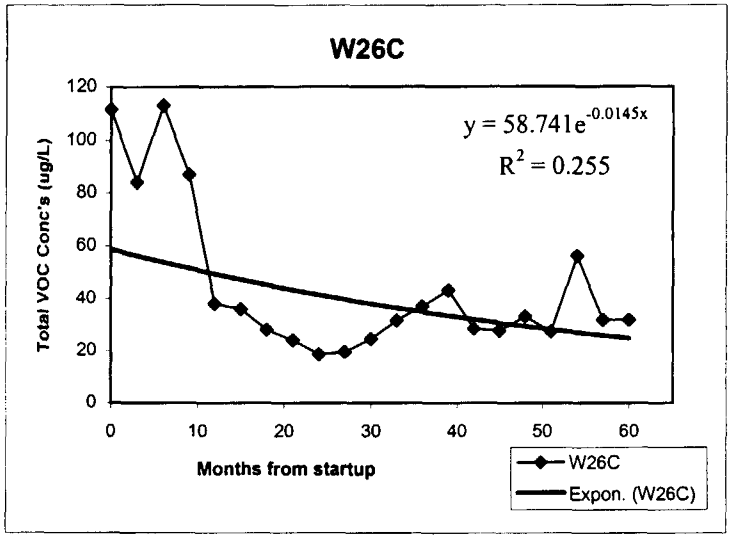
(5) Blank cells indicate that analyses were not conducted or samples not collected on this event date.

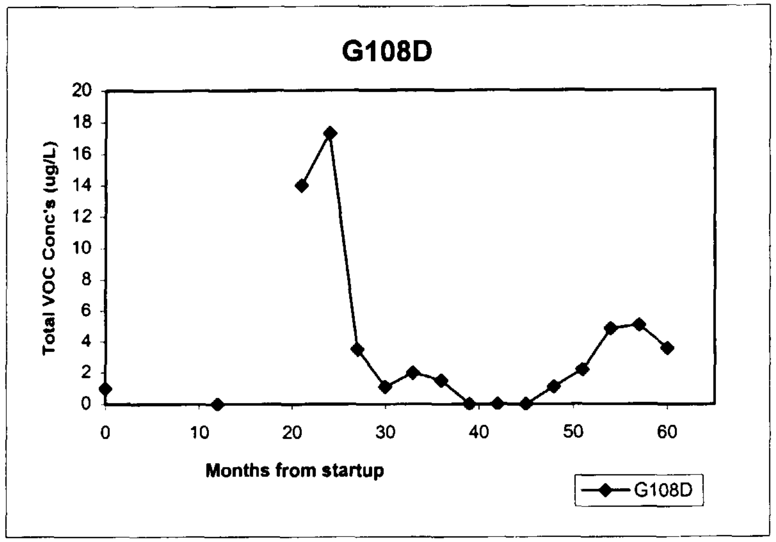
MLN/mln/LAS

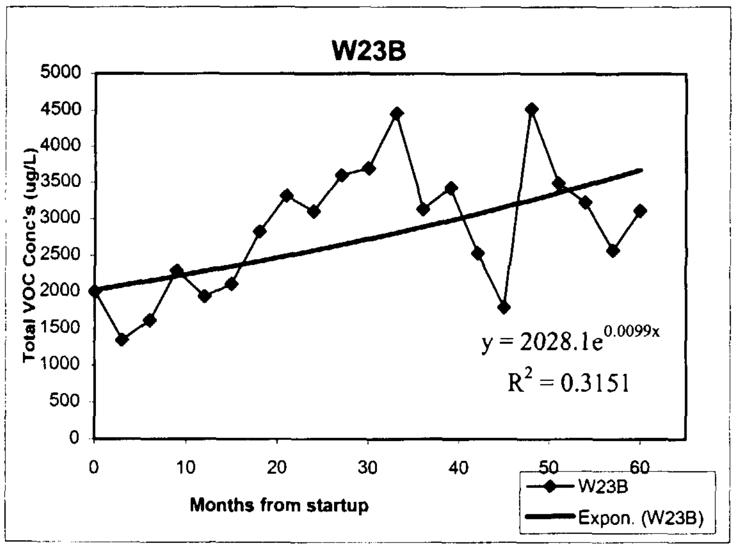
n:/jobs/208/2402/01/wp/tbl/FS Resp to Comments trends.xls (Table 1)

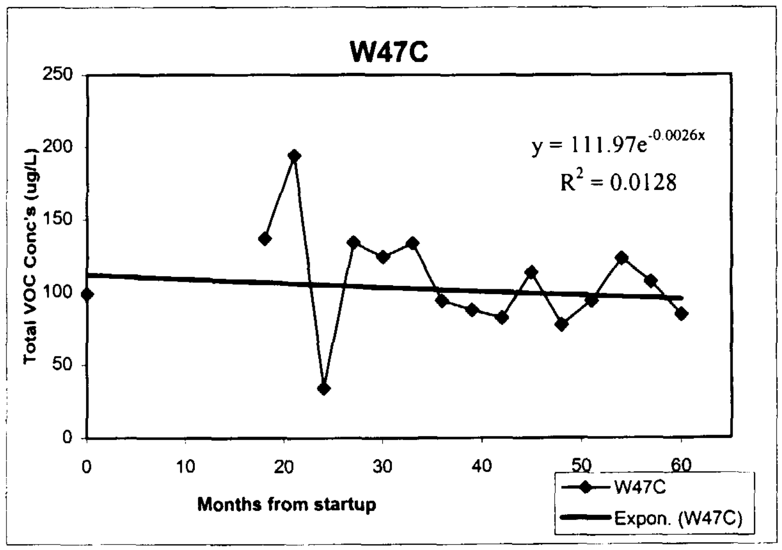
2082402.01180101-MAD

APPENDIX C
TOTAL VOC CONCENTRATION ANALYSES
Feasibility Study
Beloit Corporation - Rockton Facility NPL Site
Rockton, Illinois

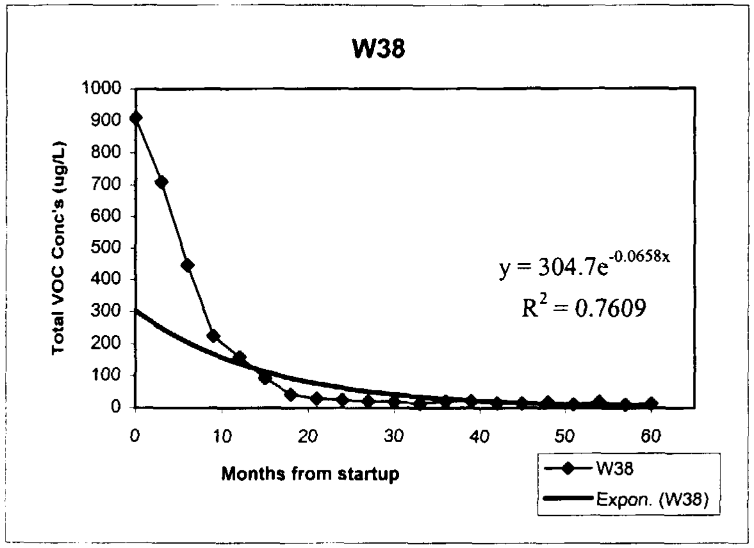


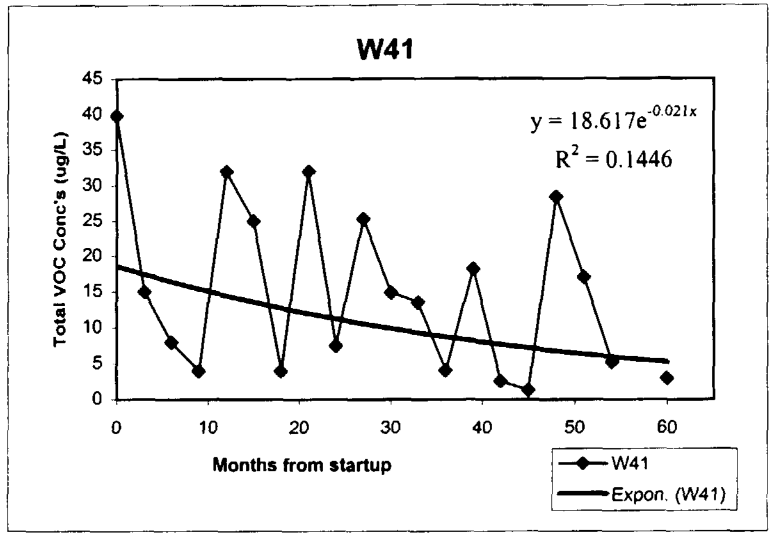


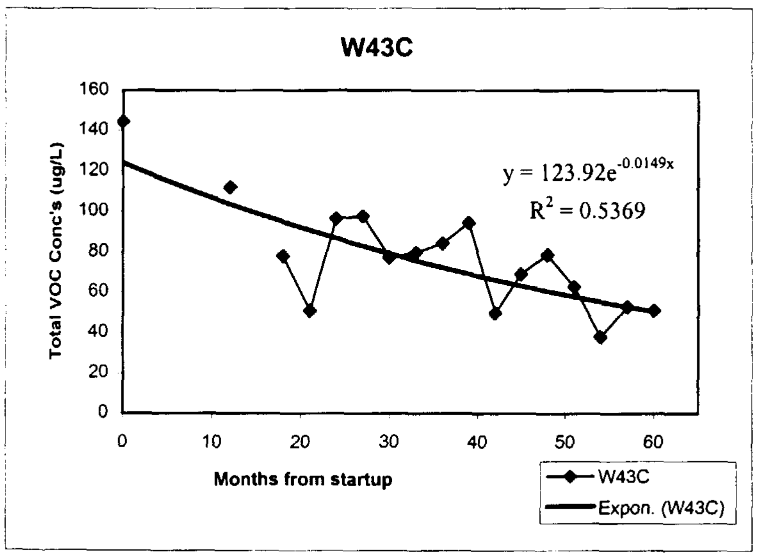


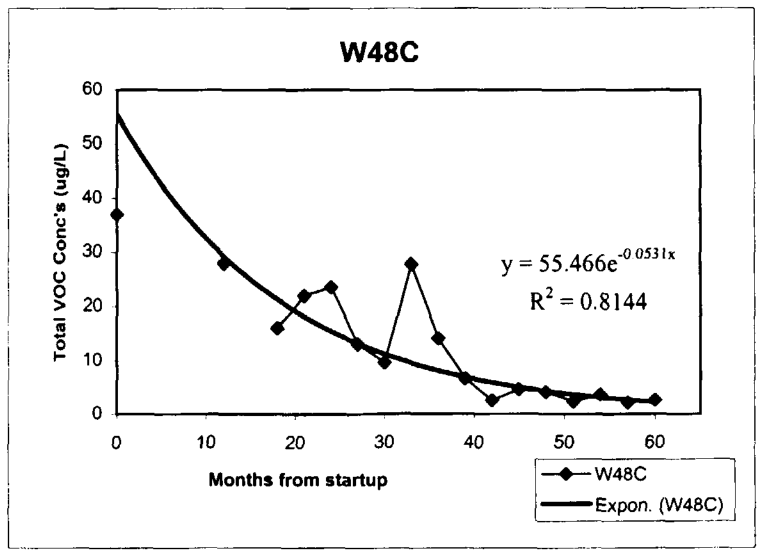


APPENDIX C
TOTAL VOC CONCENTRATION ANALYSES
Feasibility Study
Beloit Corporation - Rockton Facility NPL Site
Rockton, Illinois

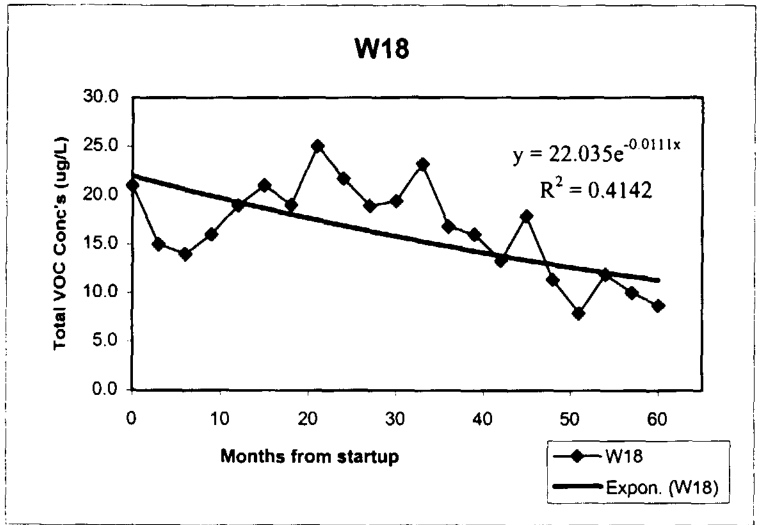


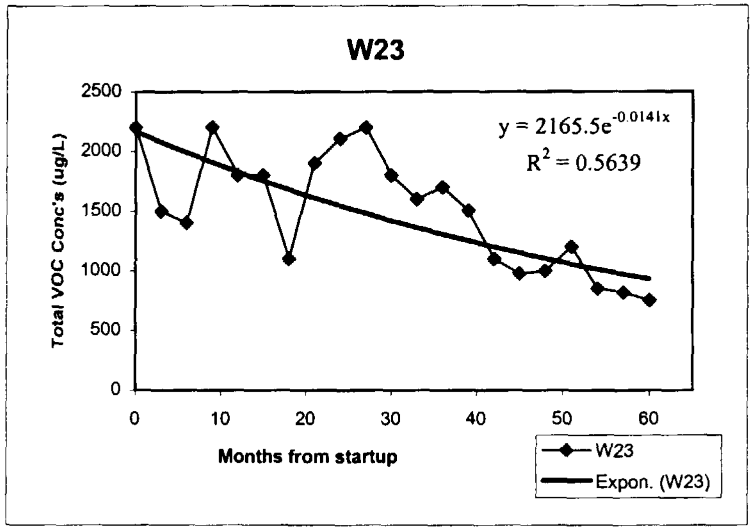






APPENDIX C
TOTAL VOC CONCENTRATION ANALYSES
Feasibility Study
Beloit Corporation - Rockton Facility NPL Site
Rockton, Illinois





MLN/mln/LAS
n:/jobs/208/2402/01/wp/tbl/FS Resp to Comments trends.xls (well-trends)
2082402.01180101-MD